

# **Arizona Department of Transportation**

## **Materials Sampling, Field Testing and Laboratory Testing Plan**

**SHRP SPS-1 Project  
040100**

**State Highway No. US-93  
Federal Aid Project No. F-039-1-509  
Mohave County, Arizona**

*1993.8.2  
from Monte Symons*

**September 1992**

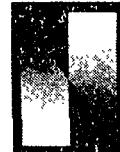


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September 23, 1992  
File: 800.12.2.9.0 - 040100

Mr. Larry Scofield  
Arizona Department of Transportation  
Arizona State University  
ERC 405  
Tempe, AZ 85287

Subject: SPS-1 Materials Testing Plan

Dear Larry:

Enclosed is a draft of the materials sampling and testing plan for the SPS-1 project on US-93 in Arizona. Please review this draft and provide any comments or questions to me or Mr. Calvin Berge.

In developing this plan we made the following assumptions and departures from the SHRP guidelines.

- The roller compacted portland cement concrete section was tested in a similar manner to portland cement concrete test sections in the SPS-2 experiment. The exception is that no plate bearing tests were included on this project.
- It was assumed that the asphalt concrete used on the SHRP test sections can be considered as a single population to be characterized. If events occur which provide a reason to split the asphalt concrete into multiple populations, for characterization purposes, then additional samples may be needed. For example, if part of the test sections were constructed, then the asphalt plant was shut down for say 3 months and then the remainder of the test sections were constructed, we might want to increase the number of samples to adequately characterize the AC from each production time frame separately.
- Bulk density measurements were specified on all asphaltic material cores. The SHRP guidelines do not require this test on all specimen. The purpose is to have densities on all specimen tested for resilient modulus, creep, and indirect tensile strength.

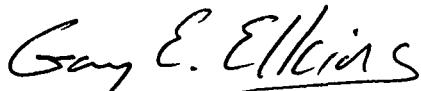
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Mr. Larry Scofield  
September 23, 1992

I have also not included any deflection testing of the individual pavement layers since it is not a standard SHRP data requirement for the SPS-1 study. However, if Arizona wishes, we could include FWD tests on the surface of the subgrade and base layers on several sections to get a measure of the "strength" of each of these layers. This information poses interesting backcalculation possibilities, it also provides data to better estimate the structural capacity and has many other uses. SHRP has developed a test procedure for these measurements primarily for use on the SPS-2. We recommend that Arizona consider having these measurements performed.

It is our understanding that ADOT will issue a separate contract for the conduct of this work. Let us know if you would like us to place this document in a different format suited to your procurement requirements. If you would like a copy of the computer files, the text file is in WordPerfect 5.1 and the graphics are in AutoCad.

I am forwarding a copy of this plan to the FHWA-LTPP division and the current LTPP Technical Assistance Contractor for review and comment.

Sincerely,  
NICHOLS CONSULTING ENGINEERS, CHTD.



Gary E. Elkins  
Principal Investigator

cc: Cal Berge, Monte Symons, Shiraz Tayabji

enclosure

**Arizona Department of Transportation**

**Materials Sampling, Field Testing  
and Laboratory Testing Plan**

**Strategic Highway Research Program**

**SPS-1 Experimental Project**

**Federal Aid Project No. F-039-1-509**

**State Highway No. US-93**

**Mohave County**

**Arizona**

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**September 1992**

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# **Materials Sampling, Field Testing and Laboratory Testing Plan SPS-1 Experimental Project US-93 Project, Mohave County, Arizona**

This document presents a materials sampling and testing plan for the experimental Strategic Highway Research Program (SHRP) SPS-1 project on US-93, project F-039-1-509, in Mohave County, Arizona between Hoover Dam and Kingman. The experimental test sections will be constructed in the north bound direction on the US-93 main lanes.

## **Background**

The SHRP SPS-1 experiment entitled, "Strategic Study of Structural Factor for Flexible Pavements", consists of the construction of 12 test sections asphalt concrete (AC) surface layers and base layers of varying thickness and material type. Three supplemental test sections, designed by Arizona DOT, consisting of a full depth asphalt concrete section, a section with an AC surface and aggregate base and a roller compacted concrete section covered with a thin AC friction course will be constructed on this project. In addition, a section representing the Arizona standard design for the new north bound main lane on this project will be monitored.

In the next portion of this document, tables of materials sampling, field tests and laboratory test quantities are presented. This is followed by a detailed presentation of the materials sampling, field testing, and laboratory testing plan and requirements for the Arizona SPS-1 project.

## **Sampling and Testing Quantities**

The estimated quantities for materials sampling, field testing, and laboratory testing for the SPS-1 project are contained in Tables 1-3. It should be noted that the SHRP sampling and test procedures referenced in these tables and in other portions of this document must be followed in conducting this work. This includes completion and submission of all required data forms.

Table 1. Estimated quantities of laboratory materials testing for the SPS-1 experimental project, US-93 Arizona.

|   | <u>SHRP TEST<br/>Designation</u> | <u>SHRP<br/>Protocol</u>   | <u>No.</u> |
|---|----------------------------------|----------------------------|------------|
| <b>SUBGRADE</b>                               |                                  |                            |            |
| Sieve Analysis . . . . .                      | SS01 . . . . .                   | P51 . . . . .              | 9          |
| Hydrometer to 0.01 mm . . . . .               | SS02 . . . . .                   | P42 . . . . .              | 9          |
| Atterberg Limits . . . . .                    | SS03 . . . . .                   | P43 . . . . .              | 9          |
| Classification and Type of Subgrade . . . . . | SS04 . . . . .                   | P52 . . . . .              | 36         |
| Moisture-Density Relations . . . . .          | SS05 . . . . .                   | P55 . . . . .              | 9          |
| Resilient Modulus . . . . .                   | SS07 . . . . .                   | Ship to FHWA lab . . . . . | 9          |
| Unit Weight . . . . .                         | SS08 . . . . .                   | P56 . . . . .              | 9          |
| Natural Moisture Content . . . . .            | SS09 . . . . .                   | P49 . . . . .              | 9          |
| Unconfined Compressive Strength . . . . .     | SS10 . . . . .                   | P54 . . . . .              | 9          |
| Permeability . . . . .                        | SS11 . . . . .                   | P57 . . . . .              | 6          |
| In-Place Density . . . . .                    |                                  | SHRP-LTPP Method . . . . . | 57         |
| Depth to Rigid Layer . . . . .                |                                  | SHRP-LTPP Method . . . . . | 16         |
| <b>AGGREGATE BASE</b>                         |                                  |                            |            |
| Particle Size Analysis . . . . .              | UG01 . . . . .                   | P41 . . . . .              | 5          |
| Sieve Analysis (Washed) . . . . .             | UG02 . . . . .                   | P41 . . . . .              | 5          |
| Atterberg Limits . . . . .                    | UG04 . . . . .                   | P43 . . . . .              | 5          |
| Moisture-Density Relations . . . . .          | UG05 . . . . .                   | P44 . . . . .              | 5          |
| Resilient Modulus . . . . .                   | UG07 . . . . .                   | Ship to FHWA Lab . . . . . | 5          |
| Classification . . . . .                      | UG08 . . . . .                   | P47 . . . . .              | 5          |
| Permeability . . . . .                        | UG09 . . . . .                   | P48 . . . . .              | 5          |
| Natural Moisture Content . . . . .            | UG10 . . . . .                   | P49 . . . . .              | 5          |
| In-Place Density . . . . .                    |                                  | SHRP-LTPP Method . . . . . | 32         |
| <b>PERMEABLE BITUMINOUS TREATED BASE</b>      |                                  |                            |            |
| Core Examination/Thickness . . . . .          | AC01 . . . . .                   | P01 . . . . .              | 28         |
| Bulk Specific Gravity . . . . .               | AC02 . . . . .                   | P02 . . . . .              | 28         |
| Maximum Specific Gravity . . . . .            | AC03 . . . . .                   | P03 . . . . .              | 4          |
| Asphalt Content (Extraction) . . . . .        | AC04 . . . . .                   | P04 . . . . .              | 4          |
| Moisture Susceptibility . . . . .             | AC05 . . . . .                   | P05 . . . . .              | 4          |
| Permeability/Flow . . . . .                   | AC08 . . . . .                   | P08 . . . . .              | 1          |
| Resilient Modulus . . . . .                   | AC07 . . . . .                   | Ship to FHWA Lab . . . . . | 2          |
| Indirect Tensile Strength . . . . .           | AC07 . . . . .                   | Ship to FHWA Lab . . . . . | 8          |

Note 1. Will be based on ASTM B4829-88.

Table 1. Estimated quantities of laboratory materials testing for the SPS-1 experimental project, US-93 Arizona (Contd.).

|   | <u>SHRP TEST<br/>Designation</u> |                            | <u>SHRP<br/>Protocol</u> | <u>No.</u> |
|---|----------------------------------|----------------------------|--------------------------|------------|
| <b>PERMEABLE BITUMINOUS TREATED BASE</b>              |                                  |                            |                          |            |
| Core Examination/Thickness . . . . .                  | AC01 . . . . .                   | P01 . . . . .              | 28                       |            |
| Bulk Specific Gravity . . . . .                       | AC02 . . . . .                   | P02 . . . . .              | 28                       |            |
| Maximum Specific Gravity . . . . .                    | AC03 . . . . .                   | P03 . . . . .              | 4                        |            |
| Asphalt Content (Extraction) . . . . .                | AC04 . . . . .                   | P04 . . . . .              | 4                        |            |
| Moisture Susceptibility . . . . .                     | AC05 . . . . .                   | P05 . . . . .              | 4                        |            |
| Permeability/Flow . . . . .                           | AC08 . . . . .                   | P08 . . . . .              | 1                        |            |
| Resilient Modulus . . . . .                           | AC07 . . . . .                   | Ship to FHWA Lab . . . . . | 2                        |            |
| Indirect Tensile Strength . . . . .                   | AC07 . . . . .                   | Ship to FHWA Lab . . . . . | 8                        |            |
| <b>Extracted Aggregate</b>                            |                                  |                            |                          |            |
| Specific Gravity of Coarse Aggregate . . . . .        | AG01 . . . . .                   | P11 . . . . .              | 4                        |            |
| Specific Gravity of Fine Aggregate . . . . .          | AG02 . . . . .                   | P12 . . . . .              | 4                        |            |
| Type and Classification of Coarse Aggregate . . . . . | AG03 . . . . .                   | P13 . . . . .              | 4                        |            |
| Type and Classification of Fine Aggregate . . . . .   | AG03 . . . . .                   | P13 . . . . .              | 4                        |            |
| Aggregate Gradation . . . . .                         | AG04 . . . . .                   | P14 . . . . .              | 4                        |            |
| NAA Test for Fine Aggregate Particle Shape . . . . .  | AG05 . . . . .                   | P14A . . . . .             | 4                        |            |
| Coarse Aggregate Particle Shape . . . . .             | AG06 . . . . .                   | P14B . . . . .             | 4                        |            |
| <b>Asphalt Cement</b>                                 |                                  |                            |                          |            |
| Abson Recovery . . . . .                              | AE01 . . . . .                   | P21 . . . . .              | 4                        |            |
| Penetration @ 50F, 77F, 90F . . . . .                 | AE02 . . . . .                   | P22 . . . . .              | 4                        |            |
| Specific Gravity (60F) . . . . .                      | AE03 . . . . .                   | P23 . . . . .              | 4                        |            |
| Viscosity @ 77F . . . . .                             | AE04 . . . . .                   | P24 . . . . .              | 4                        |            |
| Viscosity @ 140F, 275F . . . . .                      | AE05 . . . . .                   | P25 . . . . .              | 4                        |            |
| <b>Asphalt Cement (from plant)<sup>2</sup></b>        |                                  |                            |                          |            |
| Penetration @ 50F, 77F, 90F . . . . .                 | AE02 . . . . .                   | P22 . . . . .              | 3                        |            |
| Specific Gravity (60F) . . . . .                      | AE03 . . . . .                   | P23 . . . . .              | 3                        |            |
| Viscosity @ 77F . . . . .                             | AE04 . . . . .                   | P24 . . . . .              | 3                        |            |
| Viscosity @ 140F, 275F . . . . .                      | AE05 . . . . .                   | P25 . . . . .              | 3                        |            |

Note 2. Only three samples of asphalt cement need to be tested if the same asphalt cement is used in the PBTB, BTB, and AC materials, if not, three samples of each type of asphalt used on the project are needed.

Table 1. Estimated quantities of laboratory materials testing for the SPS-1 experimental project, on, US-93 project, Arizona (Contd.).

|   | <u>SHRP TEST<br/>Designation</u> | <u>SHRP<br/>Protocol</u>   | <u>No.</u> |
|---|----------------------------------|----------------------------|------------|
| <b>BITUMINOUS TREATED BASE</b>                        |                                  |                            |            |
| Core Examination/Thickness . . . . .                  | AC01 . . . . .                   | P01 . . . . .              | 34         |
| Bulk Specific Gravity . . . . .                       | AC02 . . . . .                   | P02 . . . . .              | 34         |
| Maximum Specific Gravity . . . . .                    | AC03 . . . . .                   | P03 . . . . .              | 4          |
| Asphalt Content (Extraction) . . . . .                | AC04 . . . . .                   | P04 . . . . .              | 4          |
| Moisture Susceptibility . . . . .                     | AC05 . . . . .                   | P05 . . . . .              | 1          |
| Resilient Modulus . . . . .                           | AC07 . . . . .                   | Ship to FHWA Lab . . . . . | 3          |
| Indirect Tensile Strength . . . . .                   | AC07 . . . . .                   | Ship to FHWA Lab . . . . . | 12         |
| In-Place Density . . . . .                            |                                  | SHRP-LTPP Method . . . . . | 35         |
| <b>Extracted Aggregate</b>                            |                                  |                            |            |
| Specific Gravity of Coarse Aggregate . . . . .        | AG01 . . . . .                   | P11 . . . . .              | 4          |
| Specific Gravity of Fine Aggregate . . . . .          | AG02 . . . . .                   | P12 . . . . .              | 4          |
| Type and Classification of Coarse Aggregate . . . . . | AG03 . . . . .                   | P13 . . . . .              | 4          |
| Type and Classification of Fine Aggregate . . . . .   | AG03 . . . . .                   | P13 . . . . .              | 4          |
| Aggregate Gradation . . . . .                         | AG04 . . . . .                   | P14 . . . . .              | 4          |
| NAA Test for Fine Aggregate Particle Shape . . . . .  | AG05 . . . . .                   | P14A . . . . .             | 4          |
| Coarse Aggregate Particle Shape . . . . .             | AG06 . . . . .                   | P14B . . . . .             | 4          |
| <b>Asphalt Cement</b>                                 |                                  |                            |            |
| Abson Recovery . . . . .                              | AE01 . . . . .                   | P21 . . . . .              | 4          |
| Penetration @ 50F, 77F, 90F . . . . .                 | AE02 . . . . .                   | P22 . . . . .              | 4          |
| Specific Gravity (60F) . . . . .                      | AE03 . . . . .                   | P23 . . . . .              | 4          |
| Viscosity @ 77F . . . . .                             | AE04 . . . . .                   | P24 . . . . .              | 4          |
| Viscosity @ 140F, 275F . . . . .                      | AE05 . . . . .                   | P25 . . . . .              | 4          |
| <b>Asphalt Cement (from plant)<sup>2</sup></b>        |                                  |                            |            |
| Penetration @ 50F, 77F, 90F . . . . .                 | AE02 . . . . .                   | P22 . . . . .              | 3          |
| Specific Gravity (60F) . . . . .                      | AE03 . . . . .                   | P23 . . . . .              | 3          |
| Viscosity @ 77F . . . . .                             | AE04 . . . . .                   | P24 . . . . .              | 3          |
| Viscosity @ 140F, 275F . . . . .                      | AE05 . . . . .                   | P25 . . . . .              | 3          |

Note 2. Only three samples of asphalt cement need to be tested if the same asphalt cement is used in the PBTB, BTB, and AC materials, if not, three samples of each type of asphalt used on the project are needed.

Table 1. Estimated quantities of laboratory materials testing for the SPS-1 experimental project, on, US-93 project, Arizona (Contd.).

|   | <u>SHRP TEST<br/>Designation</u> |                            | <u>SHRP<br/>Protocol</u> | <u>No.</u> |
|---|----------------------------------|----------------------------|--------------------------|------------|
| <b>ASPHALTIC CONCRETE SURFACE</b>                     |                                  |                            |                          |            |
| Core Examination/Thickness . . . . .                  | AC01 . . . . .                   | P01 . . . . .              | 78                       |            |
| Bulk Specific Gravity . . . . .                       | AC02 . . . . .                   | P02 . . . . .              | 78                       |            |
| Maximum Specific Gravity . . . . .                    | AC03 . . . . .                   | P03 . . . . .              | 4                        |            |
| Asphalt Content (Extraction) . . . . .                | AC04 . . . . .                   | P04 . . . . .              | 4                        |            |
| Moisture Susceptibility . . . . .                     | AC05 . . . . .                   | P05 . . . . .              | 4                        |            |
| Creep Modulus . . . . .                               | AC06 . . . . .                   | Ship to FHWA Lab . . . . . | 2                        |            |
| Resilient Modulus . . . . .                           | AC07 . . . . .                   | Ship to FHWA Lab . . . . . | 9                        |            |
| Indirect Tensile Strength . . . . .                   | AC07 . . . . .                   | Ship to FHWA . . . . .     | 36                       |            |
| In-Place Density . . . . .                            |                                  | SHRP-LTPP Method . . . . . | 75                       |            |
| <b>Extracted Aggregate</b>                            |                                  |                            |                          |            |
| Specific Gravity of Coarse Aggregate . . . . .        | AG01 . . . . .                   | P11 . . . . .              | 4                        |            |
| Specific Gravity of Fine Aggregate . . . . .          | AG02 . . . . .                   | P12 . . . . .              | 4                        |            |
| Type and Classification of Coarse Aggregate . . . . . | AG03 . . . . .                   | P13 . . . . .              | 4                        |            |
| Type and Classification of Fine Aggregate . . . . .   | AG03 . . . . .                   | P13 . . . . .              | 4                        |            |
| Aggregate Gradation . . . . .                         | AG04 . . . . .                   | P14 . . . . .              | 4                        |            |
| NAA Test for Fine Aggregate Particle Shape . . . . .  | AG05 . . . . .                   | P14A . . . . .             | 4                        |            |
| Coarse Aggregate Particle Shape . . . . .             | AG06 . . . . .                   | P14B . . . . .             | 4                        |            |
| <b>Asphalt Cement</b>                                 |                                  |                            |                          |            |
| Abson Recovery . . . . .                              | AE01 . . . . .                   | P21 . . . . .              | 4                        |            |
| Penetration @ 50F, 77F, 90F . . . . .                 | AE02 . . . . .                   | P22 . . . . .              | 4                        |            |
| Specific Gravity (60F) . . . . .                      | AE03 . . . . .                   | P23 . . . . .              | 4                        |            |
| Viscosity @ 77F . . . . .                             | AE04 . . . . .                   | P24 . . . . .              | 4                        |            |
| Viscosity @ 140F, 275F . . . . .                      | AE05 . . . . .                   | P25 . . . . .              | 4                        |            |
| <b>Asphalt Cement (from plant)<sup>2</sup></b>        |                                  |                            |                          |            |
| Penetration @ 50F, 77F, 90F . . . . .                 | AE02 . . . . .                   | P22 . . . . .              | 3                        |            |
| Specific Gravity (60F) . . . . .                      | AE03 . . . . .                   | P23 . . . . .              | 3                        |            |
| Viscosity @ 77F . . . . .                             | AE04 . . . . .                   | P24 . . . . .              | 3                        |            |
| Viscosity @ 140F, 275F . . . . .                      | AE05 . . . . .                   | P25 . . . . .              | 3                        |            |

Note 2. Only three samples of asphalt cement need to be tested if the same asphalt cement is used in the PBTB, BTB, and AC materials, if not, three samples of each type of asphalt used on the project are needed.

Table 2. Estimated quantities for field and laboratory materials testing of Roller Compacted Concrete on SPS-1 project, US-93 Arizona.

|   | <u>SHRP TEST<br/>Designation</u> | <u>SHRP<br/>Protocol</u> | <u>No.</u> |
|---|----------------------------------|--------------------------|------------|
| <b>ROLLER COMPACTED CONCRETE - AS DELIVERED</b> |                                  |                          |            |
| Compressive Strength                            |                                  |                          |            |
| 14 day  | PC01                             | P61                      | 3          |
| 28 day  | PC01                             | P61                      | 3          |
| 1 year  | PC01                             | P61                      | 3          |
| Splitting Tensile Strength                      |                                  |                          |            |
| 14 day  | PC02                             | P62                      | 3          |
| 28 day  | PC02                             | P62                      | 3          |
| 1 year  | PC02                             | P62                      | 3          |
| Flexural Strength                               |                                  |                          |            |
| 14 day  | PC09                             | P69                      | 3          |
| 28 day  | PC09                             | P69                      | 3          |
| 1 year  | PC09                             | P69                      | 3          |
| Air Content                                     |                                  | ASTM C231                | 3          |
| Slump   |                                  | ASTM C143                | 3          |
| Temperature                                     |                                  | ASTM C1064               | 3          |
| <b>ROLLER CEMENT CONCRETE - AS PLACED</b>       |                                  |                          |            |
| Compressive Strength                            |                                  |                          |            |
| 14 day  | PC01                             | P61                      | 3          |
| 28 day  | PC01                             | P61                      | 3          |
| 1 year  | PC01                             | P61                      | 3          |
| Splitting Tensile Strength                      |                                  |                          |            |
| 14 day  | PC02                             | P62                      | 3          |
| 28 day  | PC02                             | P62                      | 3          |
| 1 year  | PC02                             | P62                      | 3          |
| PCC Unit Weight                                 | PC05                             | P65                      | 9          |
| Static Modulus of Elasticity                    |                                  |                          |            |
| 28 day  | PC04                             | P64                      | 3          |
| 1 year  | PC04                             | P64                      | 3          |
| Air Content @ 28 days                           | PC08                             | P68                      | 1          |
| PCC Coefficient of Thermal Expansion            | PC03                             | Ship to FHWA             | 1          |

Table 3. Estimated quantities for material sampling and other field tests on SPS-1 project, US-93 Arizona.

|  | <u>Quantity</u> | <u>Units</u>  |
|--|-----------------|---------------|
| <b>Asphalt Concrete</b>  |                 |               |
| Coring (4" diameter cores) . . . . .                                 | 576             | Linear Inches |
| Bulk Sample Mix (100 Lb samples) . . . . .                           | 4               | Number        |
| Bulk Sample Mix (200 lb sample) . . . . .                            | 1               | Number        |
| Bulk Sample Asphalt Cement (5 gallon samples) <sup>1</sup> . . . . . | 14              | Number        |
| Bulk sample AC aggregate (1,000 lb) . . . . .                        | 1               | Number        |
| <b>Bituminous Treated Base</b>                                       |                 |               |
| Coring (4" diameter core) . . . . .                                  | 264             | Linear Inches |
| Bulk Sampling Mix (100 lb samples) . . . . .                         | 4               | Samples       |
| Bulk Sample Asphalt Cement (5 gallon samples) <sup>1</sup> . . . . . | 3               | Samples       |
| <b>Permeable Bituminous Treated Base</b>                             |                 |               |
| Coring (4" diameter core) . . . . .                                  | 112             | Linear Inches |
| Bulk Sample Mix (100 lb samples) . . . . .                           | 4               | Samples       |
| Bulk Sample Asphalt Cement (5 gallon samples) <sup>1</sup> . . . . . | 3               | Samples       |
| <b>Aggregate Base</b>  |                 |               |
| Bulk Sampling (200 lb samples) . . . . .                             | 5               | Samples       |
| <b>Subgrade</b>  |                 |               |
| Thin-walled tube sampling (2 samples per hole) . . . . .             | 27              | Holes         |
| Bulk Sampling (400 lb samples) . . . . .                             | 9               | Samples       |
| <b>Roller Compacted Concrete</b>                                     |                 |               |
| Coring (4" diam. cores) . . . . .                                    | 390             | Linear Inches |
| Bulk Sampling (molded into 6 cores and 3 beams per sample) . . . . . | 3               | Samples       |
| <b>Shoulder Auger Probes</b> . . . . .                               | 320             | Linear Feet   |
| <b>Elevation Surveys</b> . . . . .                                   | 280             | Person-Hours  |
| (5 person hours per section per layer, ~60 points/section/layer)     |                 |               |
| <b>Shipping to FHWA labs and SHRP Reference Library</b>              |                 |               |
| AC Cores . . . . .   | 36              | Cores         |
| BTB Cores . . . . .  | 12              | Cores         |
| PBTB Cores . . . . .   | 8               | Cores         |
| PCC Cores . . . . .  | 1               | Cores         |
| AC Bulk sample (5 gallon buckets) . . . . .                          | 200             | pounds        |
| Asphalt Cement sample . . . . .                                      | 11              | 5 gal pails   |
| Bulk AC aggregate sample . . . . .                                   | 2               | 500 lb drums  |

Note 1. For LTPP program, only three samples of asphalt cement need to be tested if the same asphalt cement is used in the PBTB, BTB, and AC materials, if not, three samples of each type of asphalt used are needed.

# **Sampling and Testing of SPS-1 Test Sections**

This portion of the document presents the details of material sampling, field testing and laboratory testing for the experimental test sections to be constructed and monitored. Material sampling and testing on this project includes the following measurements, tests and samples from the various pavement layers:

## *Subgrade*

- Bulk sampling and thin-walled tube sampling from the prepared subgrade surface.
- Moisture and density tests on the prepared subgrade surface.
- Auger probes through the shoulder to a depth of 20' below the prepared subgrade or embankment surface.
- Base line elevation surveys on the surface of the prepared subgrade or embankment to use as a reference in determining layer thickness.

## *Aggregate Base*

- Bulk sampling of the Aggregate Base (AB).
- Moisture and density tests on the compacted AB.
- Elevation measurements on the prepared AB surface.

## *Permeable Bituminous Treated Base*

- Bulk sampling of the Permeable Bituminous Treated Base (PBTB) material.
- Coring of the PBTB for laboratory testing.
- Elevation measurements on the prepared PBTB surface.

## *Bituminous Treated Base*

- Bulk sampling of the Bituminous Treated Base (BTB) material.
- Coring of the BTB for laboratory testing.
- Elevation measurements on the prepared BTB surface.

### *Asphalt Concrete Surface*

- Bulk sampling of the Asphalt Concrete (AC) material.
- Coring of the AC for laboratory testing.
- Density test on compacted AC.
- Elevation measurements on the prepared AC surface.

### *Roller Compacted Concrete*

- Bulk sampling and molding of Roller Compacted Concrete (RCC) specimens for laboratory testing.
- Slump, air content and temperature measurements on as-delivered RCC mix.
- Coring of the RCC for laboratory testing.
- Elevation measurements on the finished pavement surface.

The development of the materials sampling plan was based upon an assumed continuous construction sequencing. Significant time delays between the construction of the test sections may require changes to this sampling plan. The details for these samples, tests, and measurements are presented in subsequent portions of this document organized by material layer type.

The terminology of the Arizona Department of Transportation (ADOT) is used for the various pavement material layers in this document. These terms differ from those in the SHRP SPS-1 construction guidelines. The following terms for the various pavement materials are used:

| Terminology in this document      |              | SHRP Terminology               |
|-----------------------------------|--------------|--------------------------------|
| Term                              | Abbreviation |                                |
| Aggregate Base                    | AB           | Dense Graded Aggregate Base    |
| Bituminous Treated Base           | BTB          | Asphalt Treated Base           |
| Permeable Bituminous Treated Base | PBTB         | Permeable Asphalt Treated Base |
| Asphalt Concrete                  | AC           | Asphalt Concrete               |
| Asphalt Concrete Friction Course  | ACFC         | -                              |
| Roller Compacted Concrete         | RCC          | -                              |

## **Referenced Documents**

In addition to the appropriate AASHTO and ASTM standards methods and tests referenced in this document, the following SHRP documents serve as reference material which contain greater details on the sampling and testing required for the SPS-1 project:

**Specific Pavement Studies, Materials Sampling and Testing Requirements for Experiment SPS-1, Strategic Study of Structural Factors for Flexible Pavements**, Operational Memorandum No. SHRP-LTPP-OM-021, Strategic Highway Research Program, February, 1991.

**SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling, Version 2.0**, Operational Guide No. SHRP-LTPP-OG-006, Strategic Highway Research Program, May 1990.

**Specific Pavement Studies, Construction Guidelines for Experiment SPS-1, Strategic Study of Structural Factors for Flexible Pavements**, Operational Memorandum No. SHRP-LTPP-OM-017, Strategic Highway Research Program, December, 1990.

**SHRP-LTPP Interim Guide for Laboratory Material Handling and Testing (AC, Bituminous Materials, Aggregates and Soils)**, Operational Guide No. SHRP-LTPP-OG-004, Strategic Highway Research Program, November, 1989, (Revised January, 1992).

For the RCC test section, the following reference document from the SHRP SPS-2 experiment also applies:

**Specific Pavement Studies, Materials Sampling and Testing Requirements for Experiment SPS-2, Strategic Study of Structural Factors for Rigid Pavements**, Operational Memorandum No. SHRP-LTPP-OM-0022, Strategic Highway research Program, April 1991.

## Test Section Layout

The stationing for the location of the test sections are shown in Tables 4 and 5. In these tables the 6 digit test section number and the SHRP and Arizona test section numbers are shown. The 6 digit number is the official test section number for use on all data forms. The last two numbers of the six digit number correspond to the SHRP test section designation. The SHRP and ADOT test section numbers are shown in parentheses. In Table 4 the location of each section is specified in terms of the project's construction stationing. The relevant design features of each test section are also shown in this table.

In Table 5, the location of each test section is specified in terms of the construction stationing, test section stationing, and SHRP reference project stations. Construction stations are the same as those shown on the construction plans. Test section stationing refers to the method SHRP uses to reference locations within and adjacent to the ends of individual test sections. The SHRP test section stations start with station 0+00 assigned to the beginning of the 500' monitoring portion of the test section, and station 5+00 at the end of the monitoring portion. The SHRP reference project station is a continuous stationing system that starts from the beginning of the monitoring portion of the first test section encountered on the project. This system will be used by SHRP for future monitoring measurements on these test sections.

In general, all material sampling of compacted material should occur at the ends of the test section between the start of the test section and the start of the monitoring portion, or between the end of the monitoring portion and the end of the test section. The only samples and tests performed within the 500' monitoring portion are for the sampling of the subgrade and nuclear moisture-density tests.

Figure 1 illustrates the ordering and combination of pavement structures in the experimental test sections to be constructed. Construction stations are shown in this figure. Stylized changes in the pavement structure are shown to occur in the transition sections between test sections. The actual details will depend upon construction sequence and practice. Section 28, the test section consisting of ADOT's pavement design for this project which will be monitored, is not shown in this figure.

## **Summary of Sampling and Testing on each Test Section**

An overview of the materials sampling and testing to be performed on all test sections are shown in Figures 2 to 6. Samples and tests on the subgrade and all other pavement layers, are illustrated in these figures.

Figures 7 through 22 illustrate the sampling and test details for each test section. In these figures, the surface material present during the various construction stages are shown starting with the surface of the prepared subgrade. Locations are specified by the test section stations relative to the beginning and end of the monitoring portion of each test section. The construction stations of the beginning and end of the monitoring portion of the test section are shown for reference. The only measurements not shown in these figures are the elevation surveys to be performed on the finished surface of each material layer. The further details associated with the sampling and testing shown in these figures are provided in the tables presented in the following portion of this document arranged by layer material type.

### **Subgrade**

The measurements, tests and samples on the subgrade layer should be performed prior to placement of the base layers. The objective is to characterize the properties of the prepared subgrade surface at the time the base layers are placed. It is therefore desired that the moisture-density tests, thin-walled tube samples, bulk samples, and elevation measurements be performed just prior to the time when the base course is placed. This is important in instances when the prepared subgrade will be left exposed to the elements for a significant period, 2-3 months depending on climatic events, which might influence the properties of the upper layers of the subgrade.

A summary of the samples, laboratory and field tests on the subgrade materials is presented in Table 6. In this table, B-type samples are bulk samples and A-type samples are thin-wall (Shelby) tube samples of the subgrade materials. The T-type test locations are for nuclear moisture-density tests, and the S-type locations are for the 20' deep auger probes through the shoulder.

### *Thin-wall (Shelby) Tube Samples*

Undisturbed samples of the natural subgrade or fill material shall be obtained to a depth of 4' below the top of the prepared subgrade or fill using thin-wall (Shelby) tube sampling at the locations listed in Table 7. Two samples should be obtained at each location. These operations shall be performed in accordance with AASHTO T203 "Soil Investigation and Sampling by Auger Boring" and AASHTO M146 "Terms Relating to subgrade, Soil-Aggregate and Fill Materials". Shelby tube sampling shall be performed in accordance with AASHTO T207. If Shelby tube samples can not be obtained, split spoon samples should be obtained following Section 3.4.5 of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.

### *Bulk Samples*

Bulk samples of the subgrade or embankment material should be obtained from the locations listed in Table 8. Bulk samples of the subgrade should consist of a single excavation, 2' by 2' in area and 12 inches deep. Approximately 400 lbs of material should be obtained from each sampling location. The sampling operation should be performed following procedures contained in Section 3.5 of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling. Samples for gravimetric moisture tests should be obtained at each bulk sample location and placed in suitable containers. **In-place density and moisture tests should be obtained at each bulk sampling location prior to sampling operations.**

### *Density and Moisture Measurements*

In-place density and moisture measurements should be performed on the prepared subgrade or embankment material surface at the locations specified in Table 9 and bulk sampling locations shown in Table 8. These test shall be performed using recently calibrated nuclear moisture-density gauges in accordance with the procedures in AASHTO T238-86, Method B-Direct Transmission, AASHTO T239-86 and ASTM D2950-82. Each measurement shall be the result of the average of four readings made during each 90° rotation of the nuclear gauge through a full 360°.

### *Auger Probes*

Auger probes to a depth of 20' from the surface of the prepared subgrade or embankment should be performed at the shoulder locations specified in Table 10. The purpose of these probes is to determine if bedrock or other significantly dense layers exist within 20 feet of the pavement surface elevation. Auguring shall be performed using a truck mounted drill rig using 4 or 6 inch, continuous flight, solid, helical augers.

### **Aggregate Base**

The measurements, tests and samples on the aggregate base layer should be performed prior to placement of the next pavement layer. The objective is to characterize the properties of the prepared base at the time when the next pavement layer is placed. It is therefore desired that the moisture-density tests and elevation measurements be performed just prior to the time when the next pavement layer is placed. This is most important in instances when the aggregate base will be left exposed to the elements for a significant period, 2-3 months depending on climatic events, which might influence the properties of the material.

A summary of the samples to be taken from the Aggregate Base (AB) material and tests to be conducted are presented in Table 11. Only bulk samples and in-place moisture-density measurements are performed on the AB material.

#### *Bulk Samples*

Bulk samples of the AB material should be obtained at the approximate locations specified in Table 12. Sampling maybe performed prior to compaction to avoid interruptions to construction activities. Uncontaminated 200 lbs samples shall be obtained from each location. The procedures similar to those contained in section 3.5 of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling should be followed.

#### *Density and Moisture Measurements*

Nuclear density and moisture measurements shall be performed on top of the prepared AB at the location specified in Table 13 and bulk sampling locations shown in Table 12. These measurements shall be performed following the same procedures used for subgrade soils.

## **Permeable Bituminous Treated Base**

The field and laboratory test plan for the Permeable Bituminous Treated Base (PBTB) materials is presented in Table 14. Sampling of this material includes bulk samples of the uncompacted mix and cores obtained after placement of the AC surface material.

### *Bulk Samples*

In order to avoid obtaining material from the wrong haul truck, it is preferred that bulk samples of the uncompacted mix be obtained from a haul vehicle at the test site. Bulk sampling can be performed at the mix plant provided that the material sampled is the same material being placed in the designated test section. Care should be taken to obtain samples of the materials to be placed in the test sections shown in Figure 1. These samples shall be obtained in accordance with **AASHTO T168** and shipped to the laboratory in suitable containers. Each sample shall consist of 100 lbs of material.

Samples of the asphalt cement used for the PBTB should consist of three 5 gallon samples obtained from the mix plant. Collect samples from the mix plant after asphalt has been heated for mixing. Only three samples of each type of asphalt cement used on the project are needed. If the same asphalt cement is used for the Bituminous Treated Base or the Asphalt Concrete, then only three samples of each asphalt cement are needed.

### *Cores*

Cores of the PBTB shall be obtained at the same time the AC surface material is cored. The locations of the cores are specified in Table 18. The cores of the PBTB material designated for indirect tensile and resilient modulus testing must be shipped to the designated FHWA laboratory after the core examination and bulk specific gravity tests have been performed. The Federal Highway Administration will perform the resilient modulus test and indirect tensile strength test under a separate contract.

## **Bituminous Treated Base**

The field and laboratory test plan for the Bituminous Treated Base (BTB) materials is presented in Table 15. Sampling of this material includes bulk samples of the uncompacted mix

and cores obtained after placement of the AC surface material. Field measurements of the density of the compacted mix should be performed.

#### *Bulk Samples*

Bulk sampling of BTB includes samples of the uncompacted mix and samples of the asphalt cement used in the mixture. Samples of the uncompacted mix should be performed at the test site from the haul vehicle. Care should be taken to obtain the designated samples of the materials to be placed in the test sections shown in Figure 1. These samples shall be obtained in accordance with **AASHTO T168** and shipped to the laboratory in suitable containers. If sampling from the haul vehicle at the test site is not feasible, then bulk sampling can be performed at the mix plant provided that the material sampled is the same material being placed in the designated test section. Each sample shall consist of 100 lbs of material.

Samples of the asphalt cement should consist of three 5 gallon samples obtained from the mix plant. Collect samples from the mix plant after asphalt has been heated for mixing. Only three samples of each type of asphalt cement used on the project are needed. If the same asphalt cement is used for the Permeable Bituminous Treated Base or the Asphalt Concrete, then only three samples of each asphalt cement are needed.

#### *Cores*

Cores of the BTB shall be obtained at the same time the AC surface material is cored. The core locations are listed in Table 18. The cores of the BTB material designated for resilient modulus and indirect tensile strength tests must be shipped to the designated FHWA laboratory after the core examination and bulk specific gravity tests have been performed. The resilient modulus test and indirect tensile strength test will be performed under a separate contract with the Federal Highway Administration.

#### *Density Measurements*

Nuclear density measurements shall be performed on top of the prepared BTB at the location specified in Table 16. These measurements shall be performed following the same procedures used for subgrade soils.

## Asphalt Concrete

The field and laboratory test plan for the Asphalt Concrete (AC) materials is presented in Table 17. Sampling of this material includes bulk samples of the asphalt, aggregate, and uncompacted mix and cores obtained after placement and compaction of the AC surface material.

### *Bulk Samples*

Bulk sampling of the uncompacted mix should be performed at the test site from a haul vehicle. Care should be taken to obtain the designated samples of the materials to be placed in the test sections shown in Figure 1. These samples shall be obtained in accordance with AASHTO T168 and shipped to the laboratory in suitable containers. If sampling from the haul vehicle at the test site is not feasible, then bulk sampling can be performed at the mix plant provided that the material sampled is the same material being placed in the designated test section. Each sample shall consist of 100 lbs of material.

Samples of the asphalt cement should consist of three 5 gallon samples obtained from the mix plant. Collect samples from the mix plant after asphalt has been heated for mixing. Only three samples of each type of asphalt cement used on the project are needed. If the same asphalt cement is used for the Permeable Bituminous Treated Base or the Bituminous Treated Base, then only three samples of each asphalt cement are needed.

In addition to the bulk samples described above for SPS testing purposes, the following bulk samples should be obtained for the SHRP Reference Materials Laboratory:

- 55 gallons of asphalt cement used in the asphalt concrete mix. Collect from mix plant after asphalt has been heated for mixing. Eleven 5-gallon pails will be provided by SHRP for shipping and storage.
- 1,000 lbs of the finished aggregate product (combined coarse and fine aggregate) used in the asphalt concrete mix. This material shall be sampled in accordance with applicable portions of AASHTO Designation T2. For drum plants, the aggregate should be obtained from the charging (inclined) conveyor using the bypass chute, if possible. Otherwise the material should be taken from the belt on the charging conveyor. The aggregates should

be sampled from the inclined conveyor at the dryer on batch plants. This material should be collected in two 55-gallon drums supplied by SHRP.

- 200 lbs of the finished asphalt concrete mix material used on the test sections. This material shall be sampled at the plant or from haul trucks in accordance with applicable sections of AASHTO T168. SHRP will provide 5-gallon containers for shipment and storage of this material.

#### *Cores*

All cores of the asphalt concrete and underlying asphalt treated base materials (BTB, PBTB) shall have a 4" diameter and be obtained from the same core hole. The core locations are listed in Table 18. The cores of the AC material designated for resilient modulus, indirect tensile strength, and creep modulus must be shipped to the designated FHWA laboratory after the core examination and bulk specific gravity tests have been performed. The resilient modulus test, indirect tensile strength test, and creep modulus test will be performed under a separate contract with the Federal Highway Administration.

In addition to the cores listed in Table 18, the cores listed in Table 20 shall also be obtained for shipment to the SHRP Materials Reference Library. These cores are designated as CS-##. Only the dense graded asphalt concrete surface layer, not the asphalt treated base materials, are needed for the SHRP Materials Reference Library.

Care shall be taken to insure that cores are obtained at a 90° angle to the pavement surface and that the edges are straight, intact, smooth and suitable for laboratory testing. Details on tolerances and quality control of coring operations are contained in Section 4 of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.

Care shall be taken to package all cores for transport and shipping in suitable containers to prevent damage or degradation of the cores during transport.

### *Density Measurements*

Nuclear density measurements shall be performed on top of the prepared AC at the locations specified in Table 19. These measurements shall be performed following a similar procedure to that used for subgrade soils.

## **Roller Compacted Concrete**

A summary of the sampling and testing plan for the Roller Compacted Concrete (RCC) materials is shown in Table 21 for the **as-delivered** material and Table 23 for the **as-placed** material.

### *As-Delivered*

Sampling of the concrete used in the RCC mix shall be performed in the field, during or just before placement. The test section from which the designated bulk samples should be obtained are shown in Table 22. These samples shall be obtained in accordance with AASHTO T141 "Sampling Fresh Concrete", molded into the specimens specified in Table 22, cured, packaged and shipped to the laboratory. All specimens shall be made and cured in the field in accordance with AASHTO T23 "Making and Curing Concrete Specimens in the Field" and AASHTO T126 "Making and Curing Concrete Specimens in the Laboratory". As shown in Table 22, six - 6" by 12" cylindrical specimens and three - 6"x6" by 20" long beam specimens shall be molded from each bulk sample. Molded concrete samples shall be transported in accordance with Section 10, "Transportation of Specimens to Laboratory" of ASTM C31.

Field tests shall be performed on the bulk samples of fresh concrete to determine mix temperature, slump, and air content (volumetric). Samples shall be obtained in accordance with ASTM C172 and tests performed in accordance with ASTM C1064 (temperature), ASTM C231 (air content), and ASTM C143 (slump).

### *As-Placed*

Sampling of the as-placed RCC materials shall consist of 4 inch diameter cores. The cores shall be obtained from 1 to 4 days prior to the specified age for conduct of the laboratory test designated for each core. This is to allow for a 40 hour lime water bath soak period

immediately prior to testing of strength specimen. In Table 23, tests on the cores are specified at 14 days, 28 days, and 1 year after placement. The objective of these tests are to characterize the properties of the concrete after being subjected to in-place curing conditions. The cores shall be obtained during the following time periods:

| Specified Test Age | Date After Placement to Obtain Cores |
|--------------------|--------------------------------------|
| 14 days            | 10 - 13 days                         |
| 28 days            | 24 - 27 days                         |
| 1 year             | 360 - 364 days                       |

The locations of the RCC cores specified in Table 23 are shown in Table 24. Coring operations shall be performed in accordance with **AASHTO T24 "Obtaining and Testing Drilled Cores and Sawed Beams of Concrete"** using equipment specified in the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling. Plugs shall not be inserted in cores intended for laboratory testing. All cores shall be dried prior to packaging.

Care shall be taken to insure that cores are obtained at a 90° angle to the pavement surface and that the edges are straight, intact, smooth and suitable for laboratory testing. Details on tolerances and quality control of coring operations are contained in Section 4 of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.

The cores designated for PCC coefficient of thermal expansion testing should be shipped to the Federal Highway Administration's Turner Fairbank Laboratory after the PCC unit weight test has been performed. The coefficient of thermal expansion test will be performed by the Federal Highway Administration.

## Elevation Measurements

Elevation measurements shall be made on the surface of each pavement layer (prepared subgrade or embankment, Aggregate Base, Permeable Bituminous Treated Base, Bituminous Treated Base, AC surface, and Roller Compacted Concrete) at the locations specified in Table 25. Measurements must be made to an accuracy of 0.01 feet. Care must be taken to re-establish

the same points on the surface of each succeeding material layer to insure accurate determination of the thickness of each layer.

## Data Forms

Data forms and instructions for all field sampling and measurements described in this document are contained in "**Specific Pavement Studies, Materials Sampling and Testing Requirements for Experiment SPS-1, Strategic Study of Structural factors for Flexible Pavements**" for the asphalt concrete test sections, and **Specific Pavement Studies, Materials Sampling and Testing Requirements for Experiment SPS-2, Strategic Study of Structural Factors for Rigid Pavements** for the Roller Compact Concrete test section. These data forms must be completed at the time of the work. Completed forms shall be submitted to the designated LTPP representative.

Table 4. Location of SPS-1 test sections, US-93 Arizona.

| Section No.  | Start Section | Start Monitor | End Monitor | End Section | Notes  |
|--------------|---------------|---------------|-------------|-------------|--|
| 040115 (Y15) | 1009+50       | 1011+00       | 1016+00     | 1017+25     | 7"AC/8"BTB   |
| Trans        | 1017+25       |               |             | 1017+75     |  |
| 040117 (Y17) | 1017+75       | 1019+00       | 1024+00     | 1026+00     | 7"AC/4"BTB/4"AB; Culvert @ 1025+75                                     |
| Trans        | 1026+00       |               |             | 1027+00     |  |
| 040124 (Y24) | 1027+00       | 1028+50       | 1033+50     | 1035+00     | 7"AC/12"BTB/4"PBTB   |
| Trans        | 1035+00       |               |             | 1036+00     |  |
| 040123 (Y23) | 1036+00       | 1039+50       | 1044+50     | 1051+00     | 7"AC/8"BTB/4"PBTB Culverts @ 1036+89 & 1047+00                         |
| Trans        | 1051+00       |               |             | 1052+00     |  |
| 040119 (Y19) | 1052+00       | 1053+00       | 1058+00     | 1060+13.20  | 7"AC/4"PBTB/4"AB; Guard Rail starts @ 1056+00, Bridge @ end of section |
| Bridge       | 1060+13.2     |               |             | 1061+78.82  |  |
| 040114 (Y14) | 1061+78.82    | 1065+00       | 1070+00     | 1071+00     | 7"AC/12"AB; Cross over and gate @ 1068+70                              |
| Trans        | 1071+00       |               |             | 1072+00     |  |
| 040116 (Y16) | 1072+00       | 1073+50       | 1078+50     | 1079+75     | 4"AC/12"BTB  |
| Trans        | 1079+75       |               |             | 1080+25     |  |
| 040118 (Y18) | 1080+25       | 1082+00       | 1087+00     | 1088+00     | 4"AC/8"BTB/4"AB; Culvert @ 1080+50; Cross over & Gate @ 1081+15        |
| Trans        | 1088+00       |               |             | 1089+00     |  |
| 040122 (Y22) | 1089+00       | 1089+50       | 1094+50     | 1095+00     | 4"AC/4"BTB/4"PBTB; 50' end sections                                    |
| Trans        | 1095+00       |               |             | 1096+00     |  |
| 040121 (Y21) | 1096+00       | 1097+00       | 1102+00     | 1103+50     | 4"AC/4"PBTB/12"AB; Culvert @ 1103+00                                   |
| Trans        | 1103+50       |               |             | 1104+50     |  |
| 040120 (Y20) | 1104+50       | 1108+50       | 1113+50     | 1115+50     | 4"AC/4"PBTB/8"AB; Culvert @ 1107+00                                    |
| Trans        | 1115+50       |               |             | 1116+50     |  |
| 040113 (Y13) | 1116+50       | 1117+50       | 1122+50     | 1123+50     | 4"AC/8"AB; Near at-grade   |
| Trans        | 1123+50       |               |             | 1124+50     |  |
| 040126 (AZ2) | 1124+50       | 1125+50       | 1130+50     | 1131+50     | 5"AC/4"AB  |
| Trans        | 1131+50       |               |             | 1132+50     |  |
| 040125 (AZ1) | 1132+50       | 1134+50       | 1139+50     | 1141+00     | 7"AC   |
| Trans        | 1141+00       |               |             | 1142+00     |  |
| 040127 (AZ3) | 1142+00       | 1143+00       | 1148+00     | 1149+00     | 1"ACFC/15"RCC  |
| 040128       | 1162+00       | 1162+75       | 1167+75     | 301+25      | 1"ACFC/7"AC/4"AB   |

AC - Asphalt Concrete BTB - Bituminous Treated Base

PBTB - Permeable BTB AB - Aggregate Base

RCC - Roller Compacted Concrete

ACFC - Asphalt Concrete Friction Course

Table 5. Test section location table showing construction and project stations.

| Test Section    | Location         | Construction Stationing | Test Section Stationing | SHRP Reference Project Station |
|-----------------|------------------|-------------------------|-------------------------|--------------------------------|
| 040115<br>(Y15) | Begin            | 1009+50                 | -1-50                   |                                |
|                 | Begin Monitoring | 1011+00                 | 0+00                    | 0+00                           |
|                 | End Monitoring   | 1016+00                 | 5+00                    | 5+00                           |
|                 | End              | 1017+25                 | 6+25                    | 6+25                           |
| 040117<br>(Y17) | Begin            | 1017+75                 | -1-25                   | 6+75                           |
|                 | Begin Monitoring | 1019+00                 | 0+00                    | 8+00                           |
|                 | End Monitoring   | 1024+00                 | 5+00                    | 13+00                          |
|                 | End              | 1026+00                 | 7+00                    | 15+00                          |
| 040124<br>(Y24) | Begin            | 1027+00                 | -1-50                   | 16+00                          |
|                 | Begin Monitoring | 1028+50                 | 0+00                    | 17+50                          |
|                 | End Monitoring   | 1033+50                 | 5+00                    | 22+50                          |
|                 | End              | 1035+00                 | 6+50                    | 24+00                          |
| 040123<br>(Y23) | Begin            | 1036+00                 | -3-50                   | 25+00                          |
|                 | Begin Monitoring | 1039+50                 | 0+00                    | 28+50                          |
|                 | End Monitoring   | 1044+50                 | 5+00                    | 33+50                          |
|                 | End              | 1051+00                 | 11+50                   | 40+00                          |
| 040119<br>(Y19) | Begin            | 1052+00                 | -1-00                   | 41+00                          |
|                 | Begin Monitoring | 1053+00                 | 0+00                    | 42+00                          |
|                 | End Monitoring   | 1058+00                 | 5+00                    | 47+00                          |
|                 | End              | 1060+13.20              | 7+13.2                  | 49+13.2                        |
| 040114<br>(Y14) | Begin            | 1061+78.82              | -3-21.18                | 50+78.82                       |
|                 | Begin Monitoring | 1065+00                 | 0+00                    | 54+00                          |
|                 | End Monitoring   | 1070+00                 | 5+00                    | 59+00                          |
|                 | End              | 1071+00                 | 6+00                    | 60+00                          |
| 040116<br>(Y16) | Begin            | 1072+00                 | -1-50                   | 61+00                          |
|                 | Begin Monitoring | 1073+50                 | 0+00                    | 62+50                          |
|                 | End Monitoring   | 1078+50                 | 5+00                    | 67+50                          |
|                 | End              | 1079+50                 | 6+25                    | 68+75                          |
| 040118<br>(Y18) | Begin            | 1080+25                 | -1-75                   | 69+25                          |
|                 | Begin Monitoring | 1082+00                 | 0+00                    | 71+00                          |
|                 | End Monitoring   | 1087+00                 | 5+00                    | 76+00                          |
|                 | End              | 1088+00                 | 6+00                    | 77+00                          |

Table 5. Test section location table showing construction and project stations (Contd.).

| Test Section    | Location         | Construction Stationing | Test Section Stationing | SHRP Reference Project Station |
|-----------------|------------------|-------------------------|-------------------------|--------------------------------|
| 040122<br>(Y22) | Begin            | 1089+00                 | 0-50                    | 78+00                          |
|                 | Begin Monitoring | 1089+50                 | 0+00                    | 78+50                          |
|                 | End Monitoring   | 1094+50                 | 5+00                    | 83+50                          |
|                 | End              | 1095+00                 | 5+50                    | 84+00                          |
| 040121<br>(Y21) | Begin            | 1096+00                 | -1-00                   | 85+00                          |
|                 | Begin Monitoring | 1097+00                 | 0+00                    | 86+00                          |
|                 | End Monitoring   | 1102+00                 | 5+00                    | 91+00                          |
|                 | End              | 1103+50                 | 6+50                    | 92+50                          |
| 040120<br>(Y20) | Begin            | 1104+50                 | -4-00                   | 93+50                          |
|                 | Begin Monitoring | 1108+50                 | 0+00                    | 97+50                          |
|                 | End Monitoring   | 1113+50                 | 5+00                    | 102+50                         |
|                 | End              | 1115+50                 | 7+00                    | 104+50                         |
| 040113<br>(Y13) | Begin            | 1116+50                 | -1-00                   | 105+50                         |
|                 | Begin Monitoring | 1117+50                 | 0+00                    | 106+50                         |
|                 | End Monitoring   | 1122+50                 | 5+00                    | 111+50                         |
|                 | End              | 1123+50                 | 6+00                    | 112+50                         |
| 040126<br>(AZ2) | Begin            | 1124+50                 | -1-00                   | 113+50                         |
|                 | Begin Monitoring | 1125+50                 | 0+00                    | 114+50                         |
|                 | End Monitoring   | 1130+50                 | 5+00                    | 119+50                         |
|                 | End              | 1131+50                 | 6+00                    | 120+50                         |
| 040125<br>(AZ1) | Begin            | 1132+50                 | -2-00                   | 121+50                         |
|                 | Begin Monitoring | 1134+50                 | 0+00                    | 123+50                         |
|                 | End Monitoring   | 1139+50                 | 5+00                    | 128+50                         |
|                 | End              | 1141+00                 | 6+50                    | 130+00                         |
| 040127<br>(AZ3) | Begin            | 1142+00                 | -1-00                   | 131+00                         |
|                 | Begin Monitoring | 1143+00                 | 0+00                    | 132+00                         |
|                 | End Monitoring   | 1148+00                 | 5+00                    | 137+00                         |
|                 | End              | 1149+00                 | 6+00                    | 138+00                         |
| 040128          | Begin            | 1162+00                 | 0-75                    | 151+00                         |
|                 | Begin Monitoring | 1162+75                 | 0+00                    | 151+75                         |
|                 | End Monitoring   | 1167+75                 | 5+00                    | 156+75                         |
|                 | End              | 301+25                  | 5+91.93                 | 157+66.93                      |

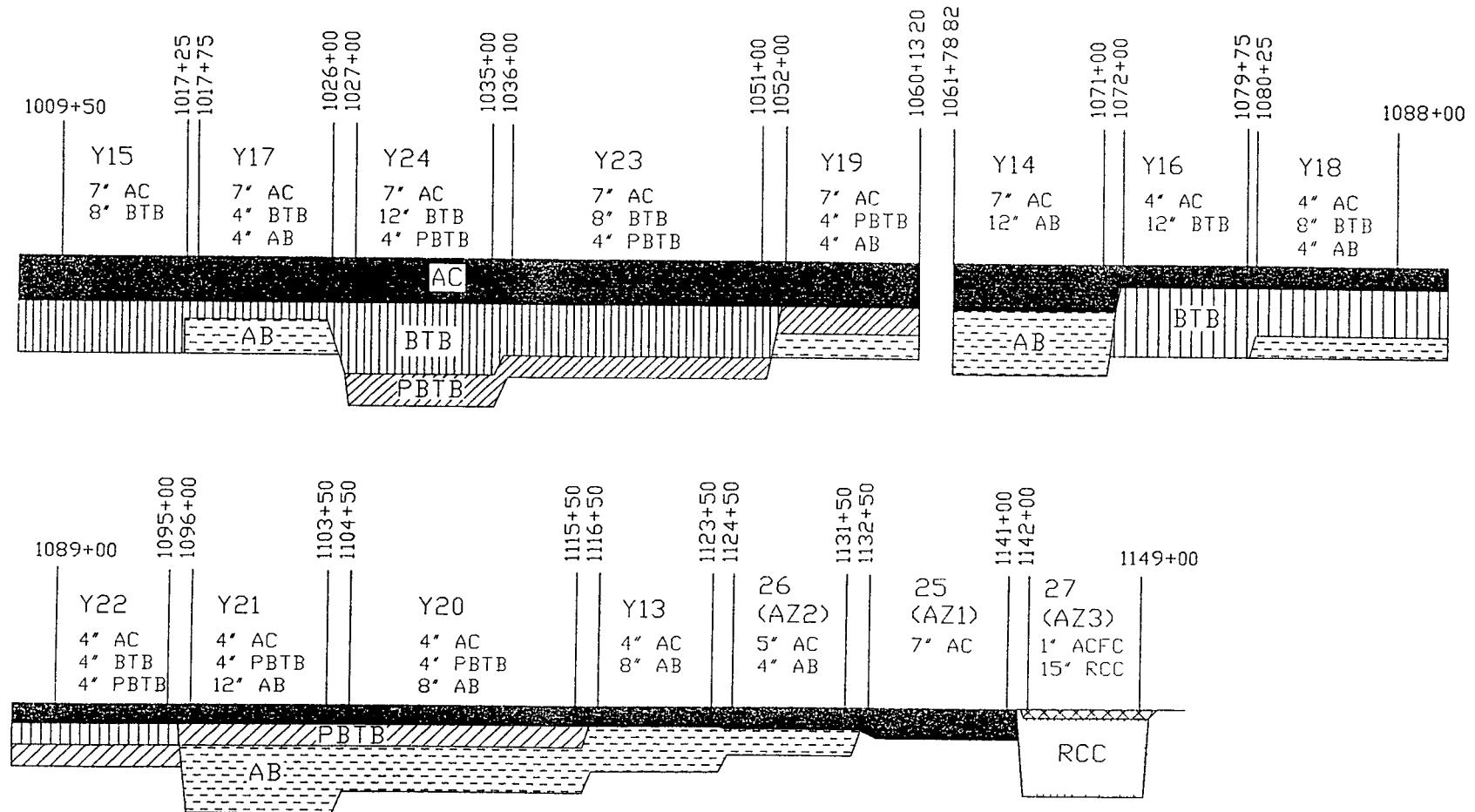
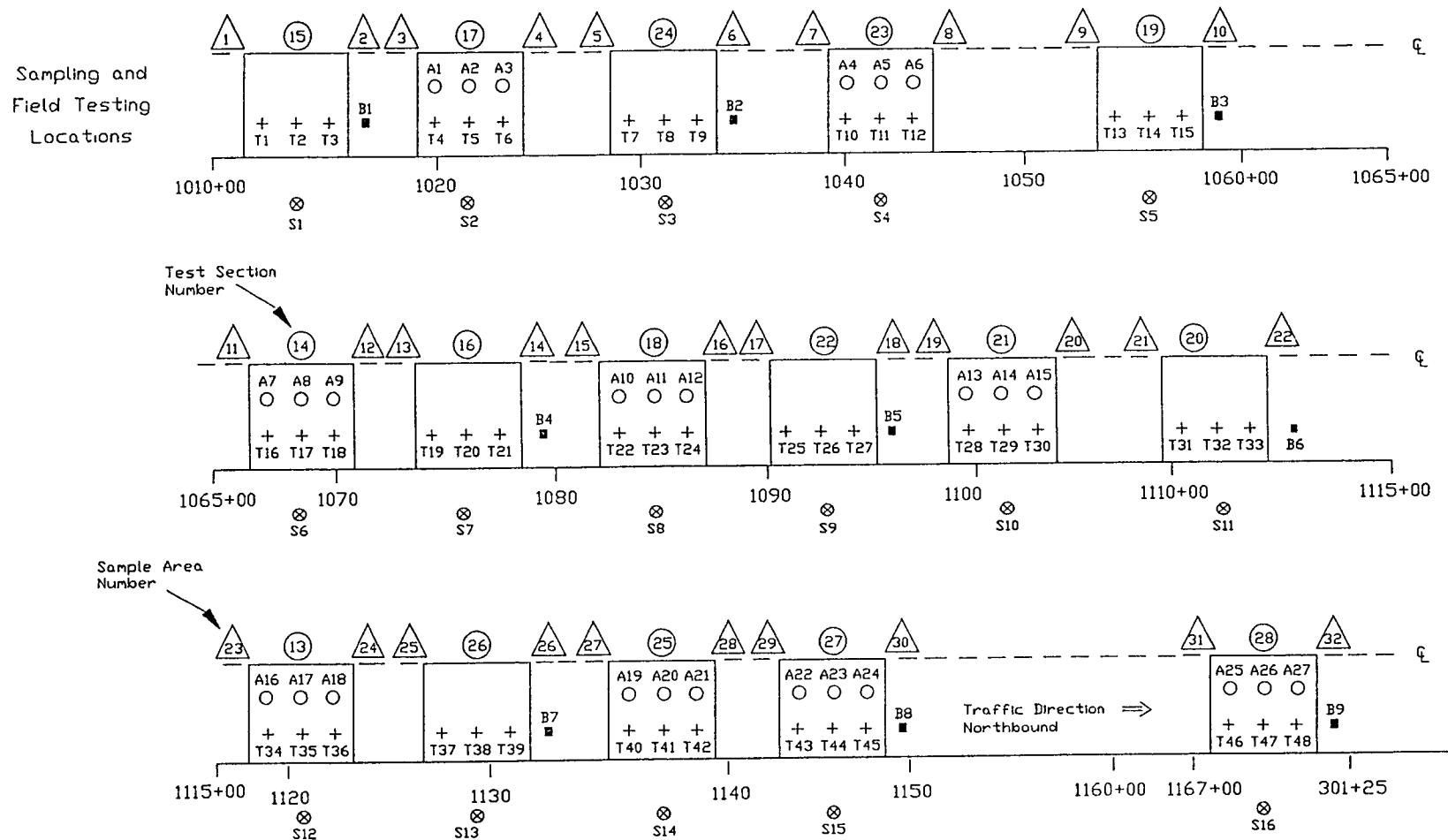
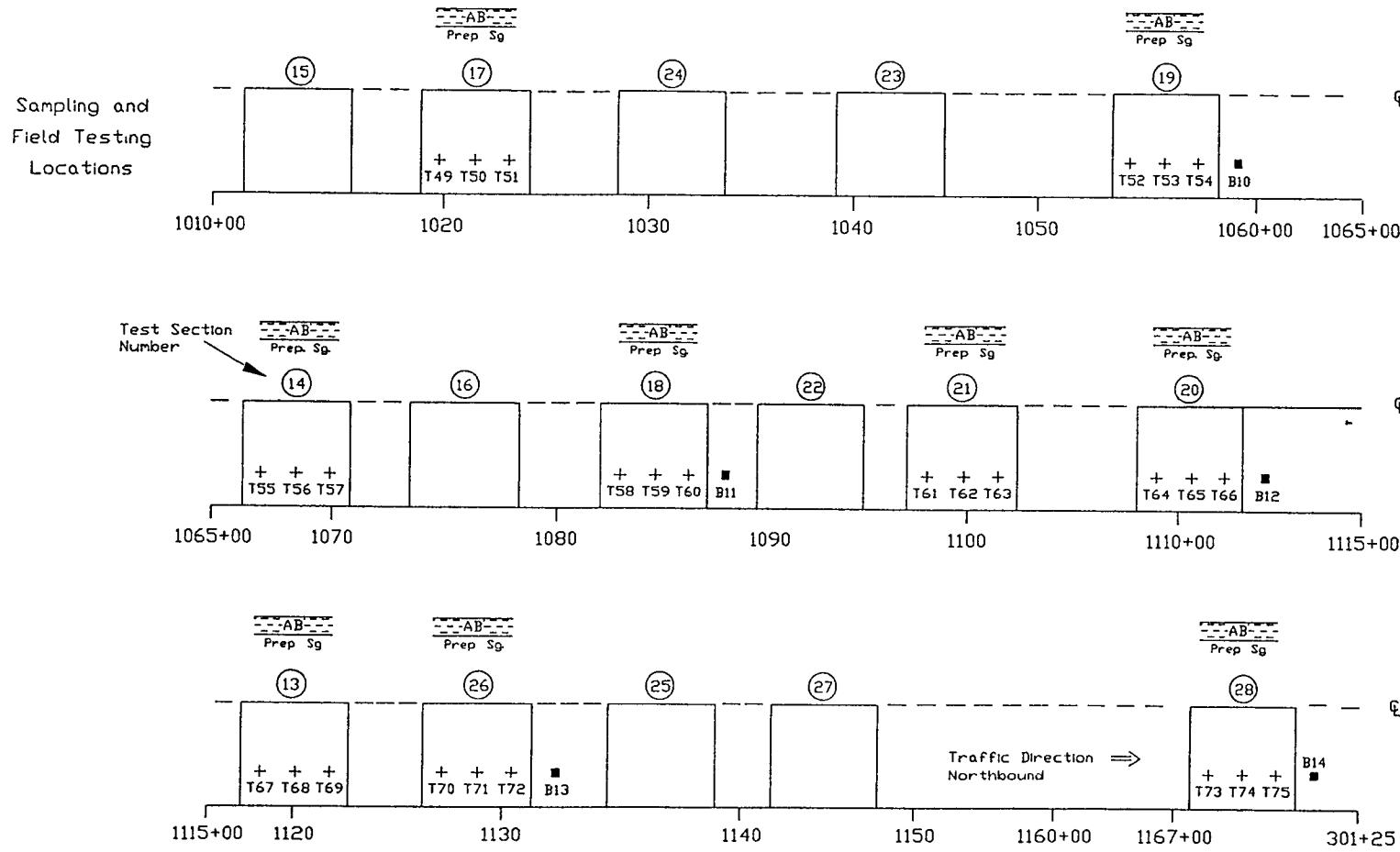


Figure 1. Layout of experimental test sections, Arizona SPS-1 project, US-93.



- 2' x 2' bulk sampling location (B1-B9) to 12' below top of subgrade
- Shelby tube/splitspoon sampling to 4' below top of prepared subgrade (A1-A27)
- $\otimes$  Shoulder Probe (S1-S16)
- + Location of nuclear moisture - density tests (T1-T48)

Figure 2. Overview of material sampling and testing on prepared Subgrade, SPS-1 Arizona.



- + Location of nuclear moisture - density tests (T49-T75)
- Location of bulk sampling of AB (B10-B14)
- Prep Sg. - Prepared Subgrade
- AB - Aggregate Base

Figure 3. Overview of material sampling and testing on Aggregate Base, SPS-1 Arizona.

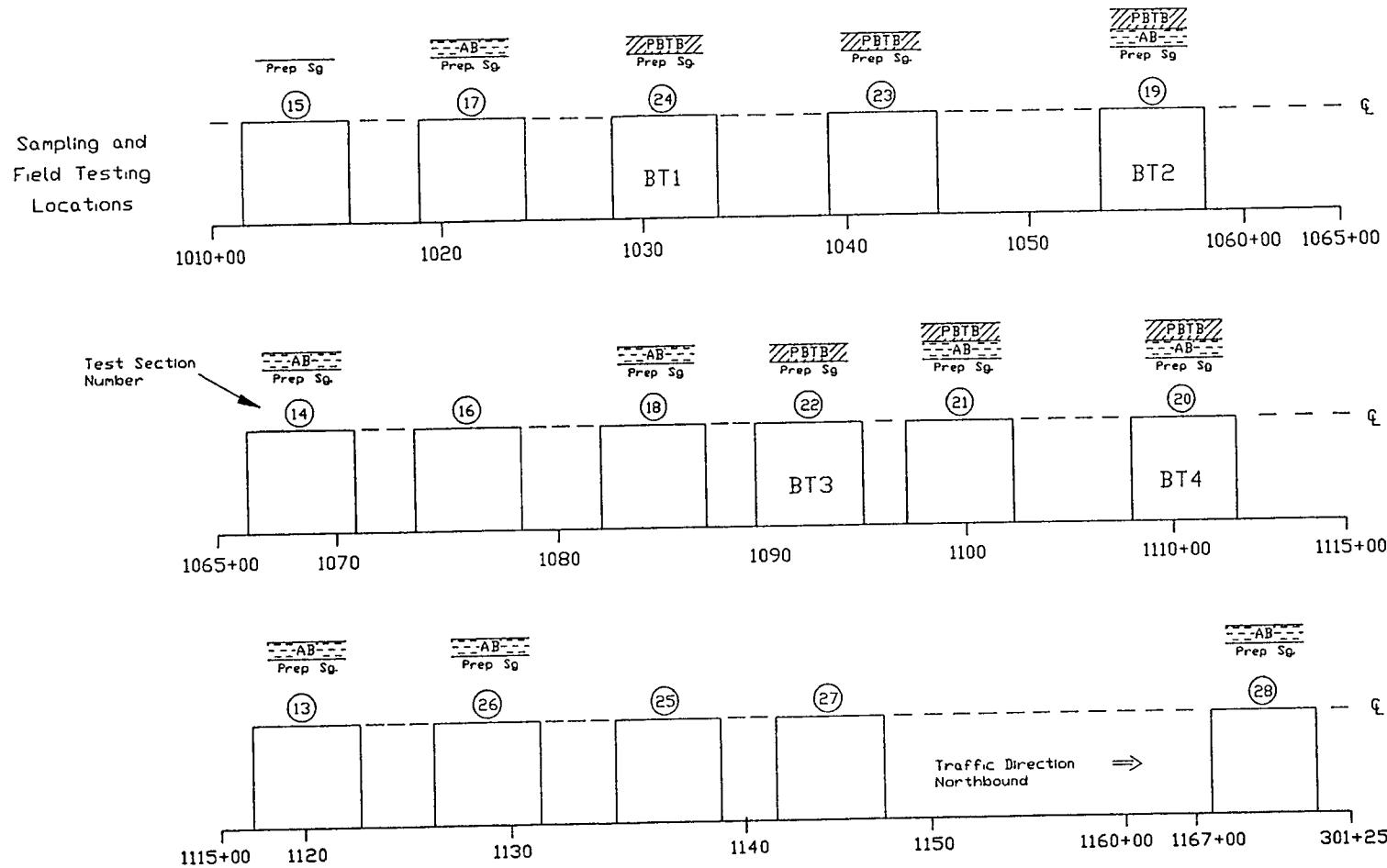
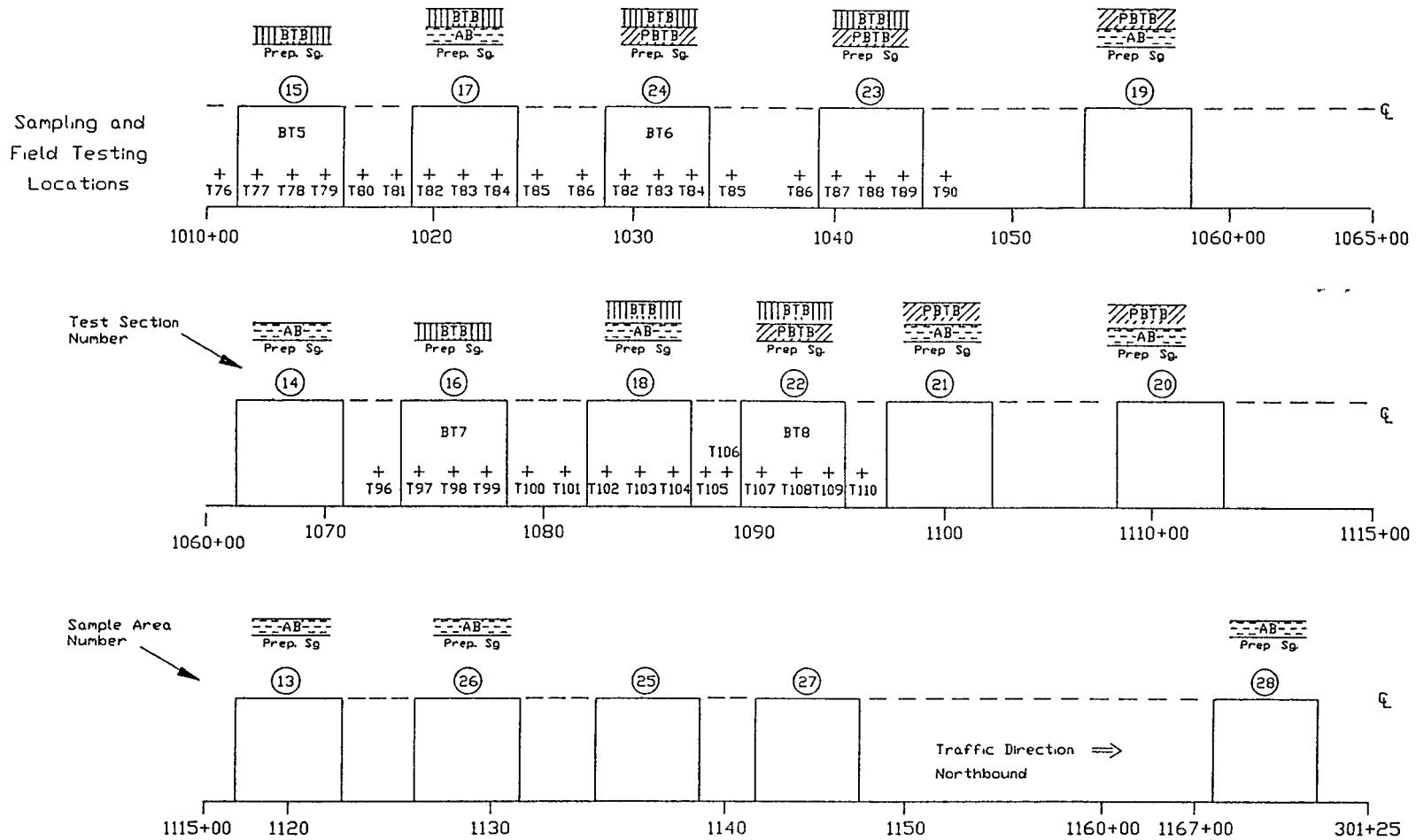


Figure 4. Overview of sampling and testing of Permeable Bituminous Treated Base, SPS-1 Arizona.

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- + Location of nuclear density tests (T76-T96)
- Test sections from which bulk samples obtained (BT5-BT8)
- Prep. Sg. - Prepared Subgrade
- PBTB - Permeable Bituminous Treated Base
- AB - Aggregate Base
- BTB - Bituminous Treated Base

Figure 5. Overview of sampling and testing of Bituminous Treated Base, SPS-1 Arizona.

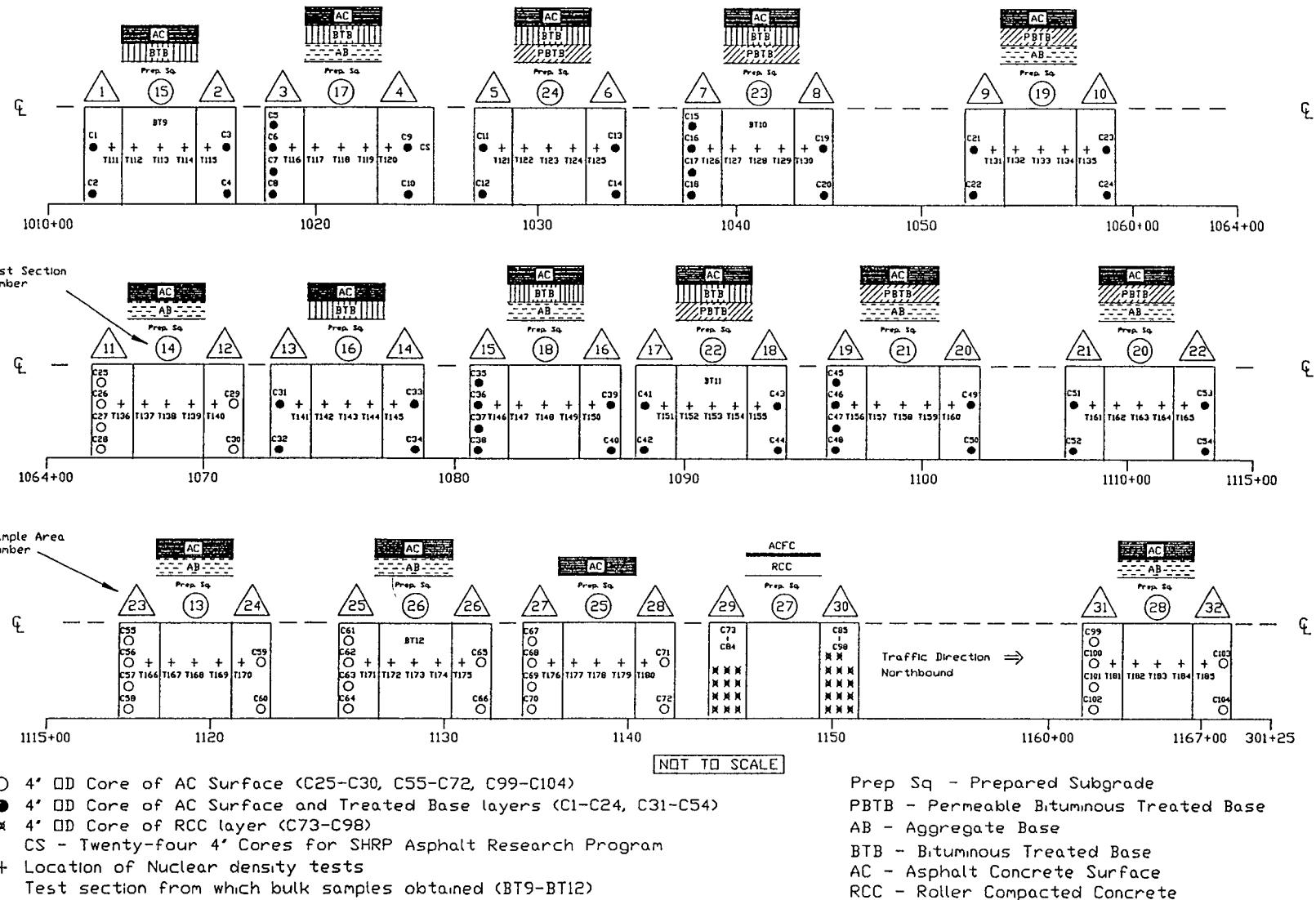
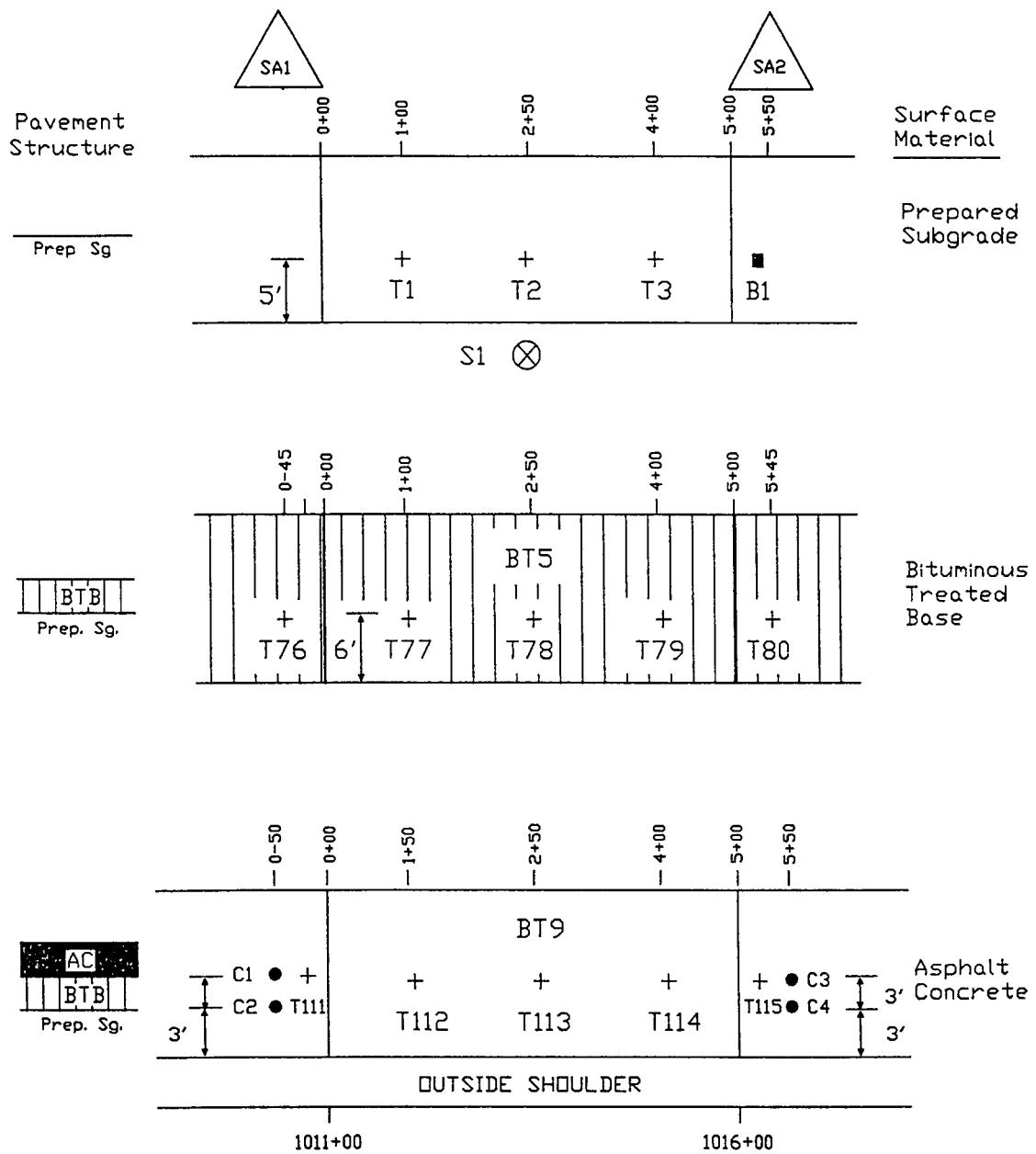
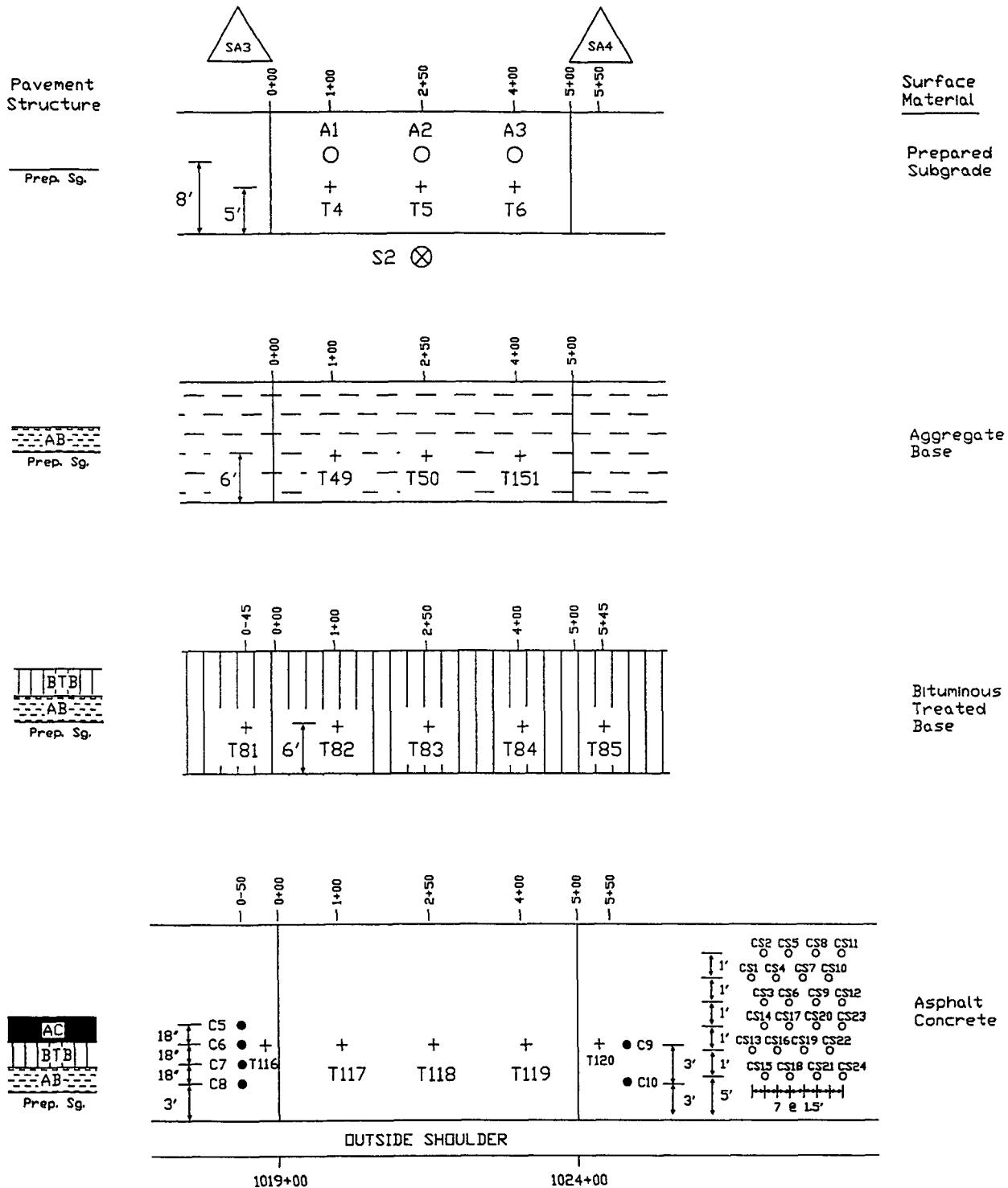


Figure 6. Overview of sampling, testing, and coring plan for sections on SPS-1 Arizona project.



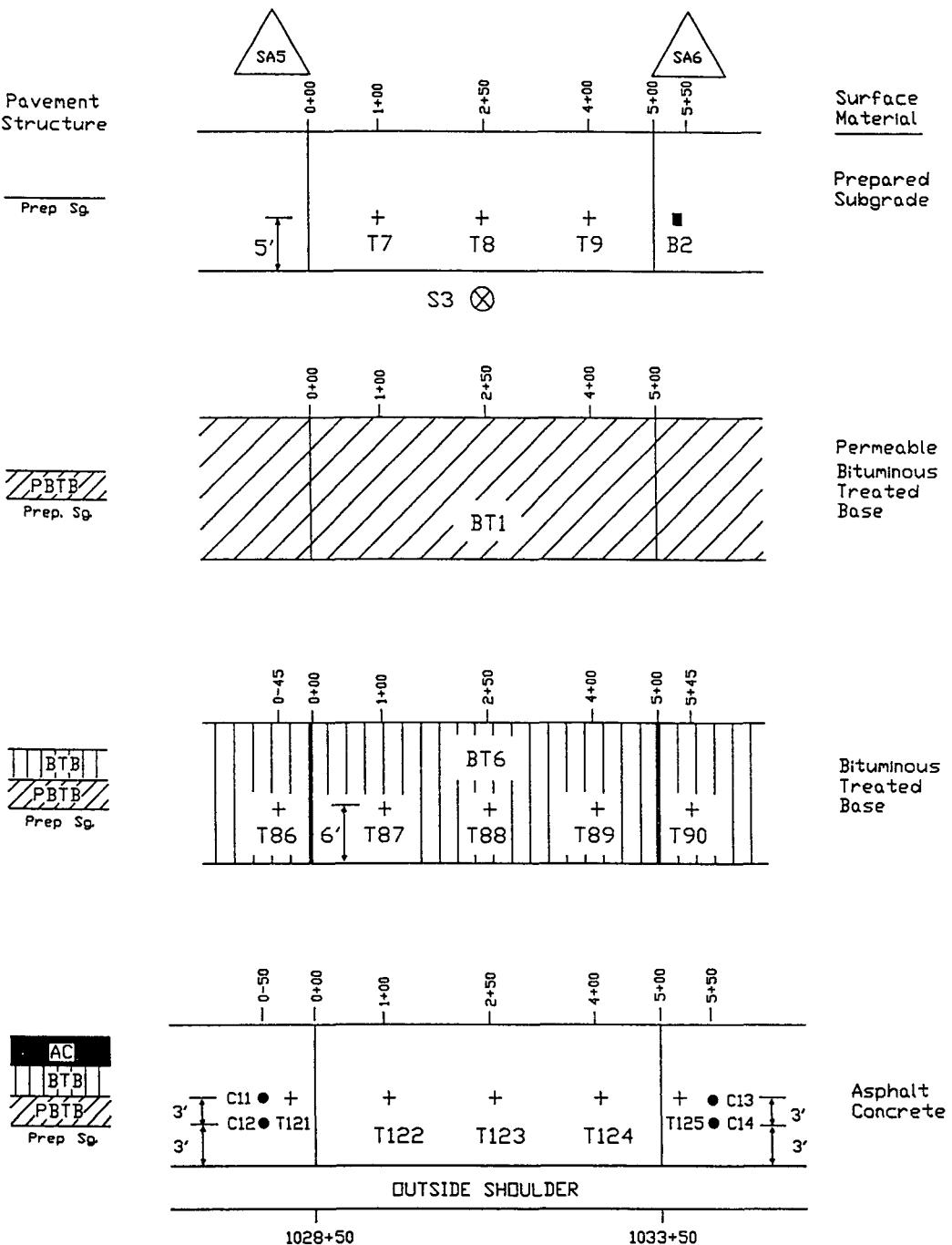
S1 - 20' shoulder probe  
 T1-T3 - Moisture-density tests on subgrade  
 B1 - Bulk sample of subgrade  
 T76-T80 - Density tests on BTB  
 BT5 - Bulk sample of BTB  
 T111-T115 - Density tests on AC  
 BT9 - Bulk sample of AC  
 C1-C4 - Cores of AC surface and BTB layer

Figure 7. Sampling and test plan for test section 040115, SPS-1 Arizona.



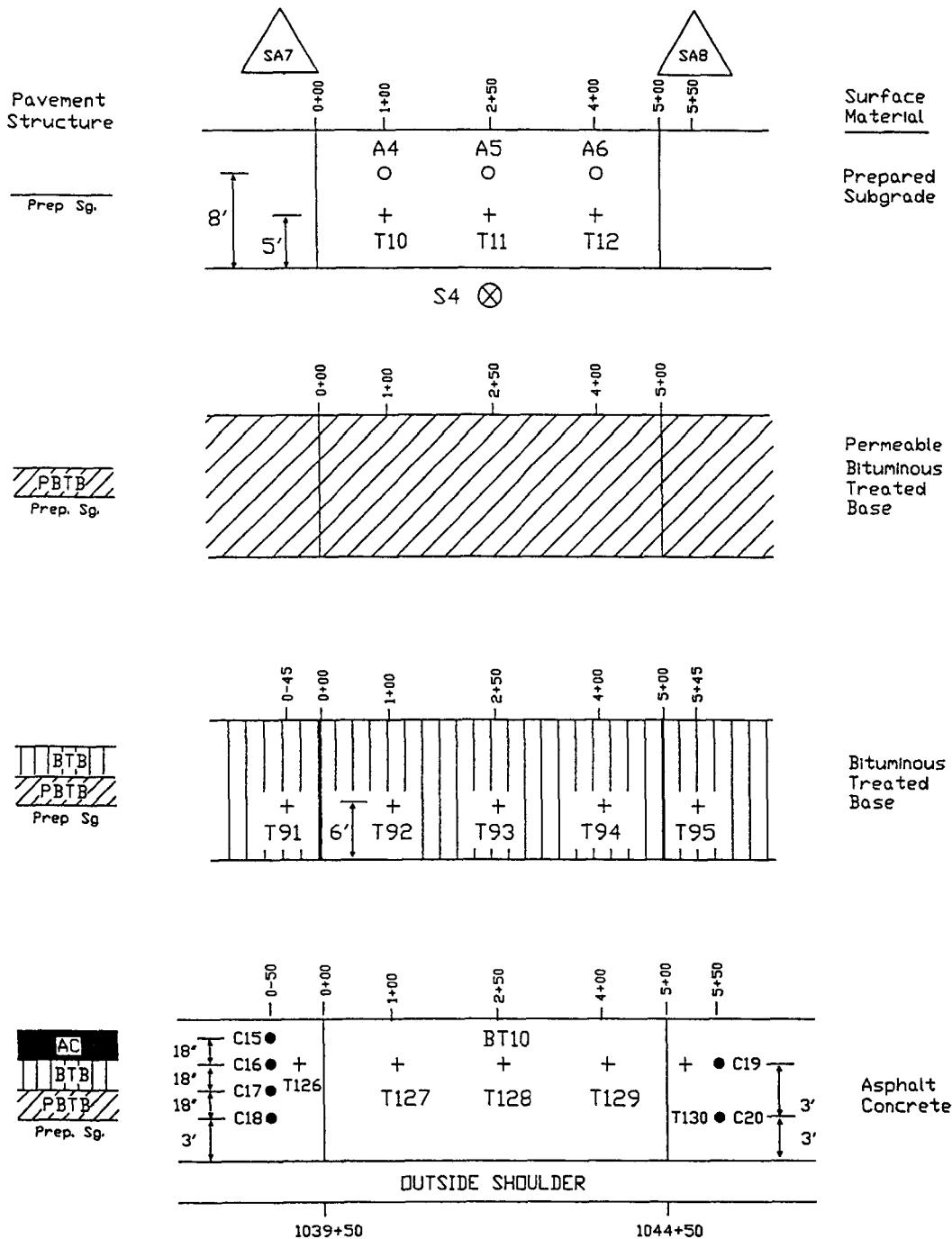
S2 - 20' shoulder probe  
 A1-A3 - Thinwall tube samples of subgrade  
 T4-T6 - Moisture-density tests on subgrade  
 T49-T51 - Moisture-density tests on AB  
 T81-T85 - Density tests on BTB  
 T116-T120 - Density tests on AC  
 C5-C10 - Cores of AC surface and BTB layer  
 CS1-CS24 - Cores of AC surface for SHRP asphalt program

Figure 8. Sampling and test plan for test section 040117, SPS-1 Arizona.



S3 - 20' shoulder probe  
 T7-T9 - Moisture-density tests on subgrade  
 B2 - Bulk sample of subgrade  
 BT1 - Bulk sample of PBTB  
 T86-T90 - Density tests on BTB  
 BT6 - Bulk sample of BTB  
 T121-T125 - Density tests on AC  
 C11-C14 - Cores of AC surface, BTB and PBTB layers

Figure 9. Sampling and test plan for test section 040124, SPS-1 Arizona.



S4 - 20' shoulder probe  
A4-A6 - Thinwall tube samples of subgrade  
T10-T12 - Moisture-density tests on subgrade  
T91-T95 - Density tests on BTB  
T126-T130 - Density tests on AC  
BT10 - Bulk sample of AC  
C15-C20 - Cores of AC surface, BTB and PBTB layers

Figure 10. Sampling and test plan for test section 040123, SPS-1 Arizona.

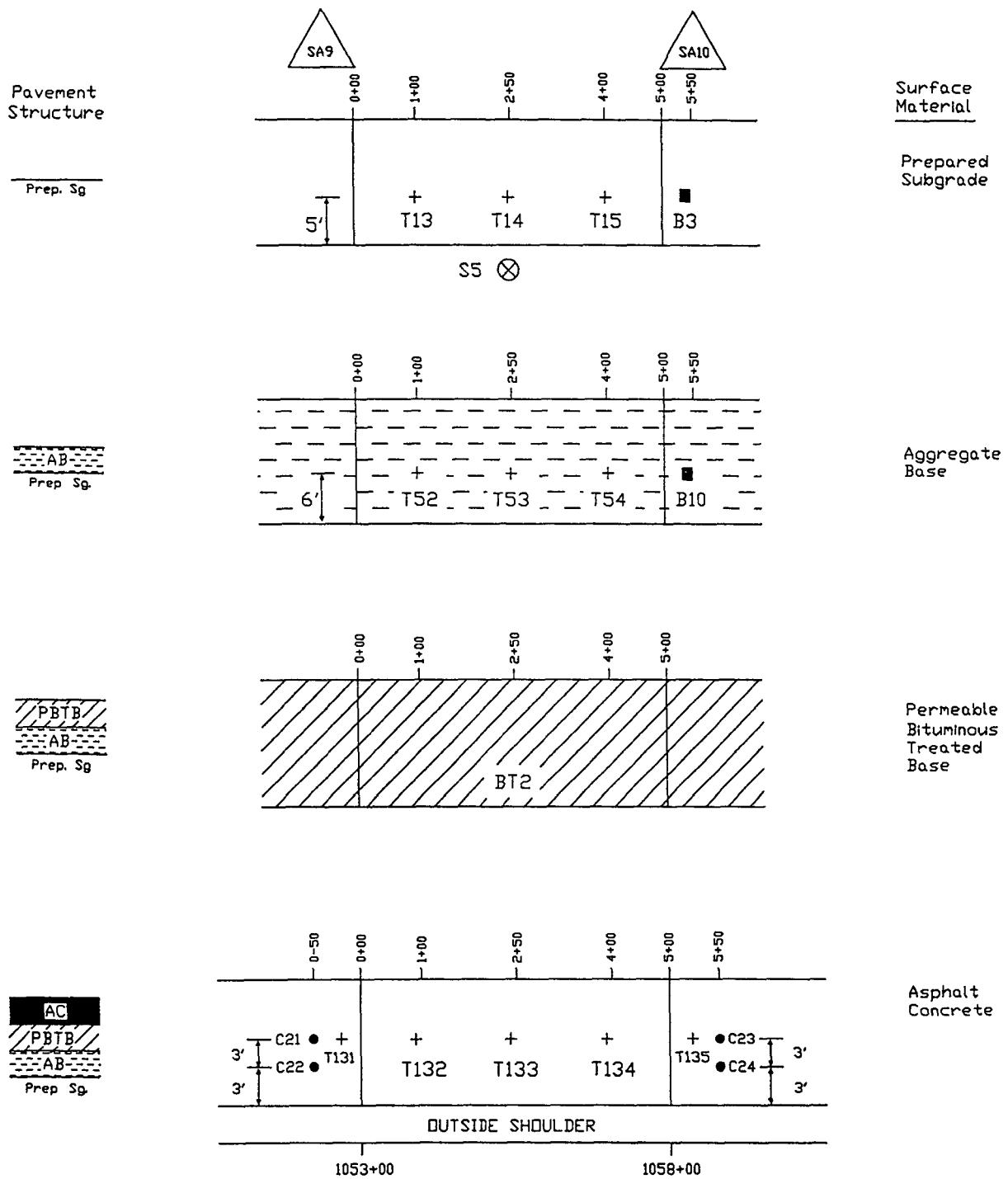
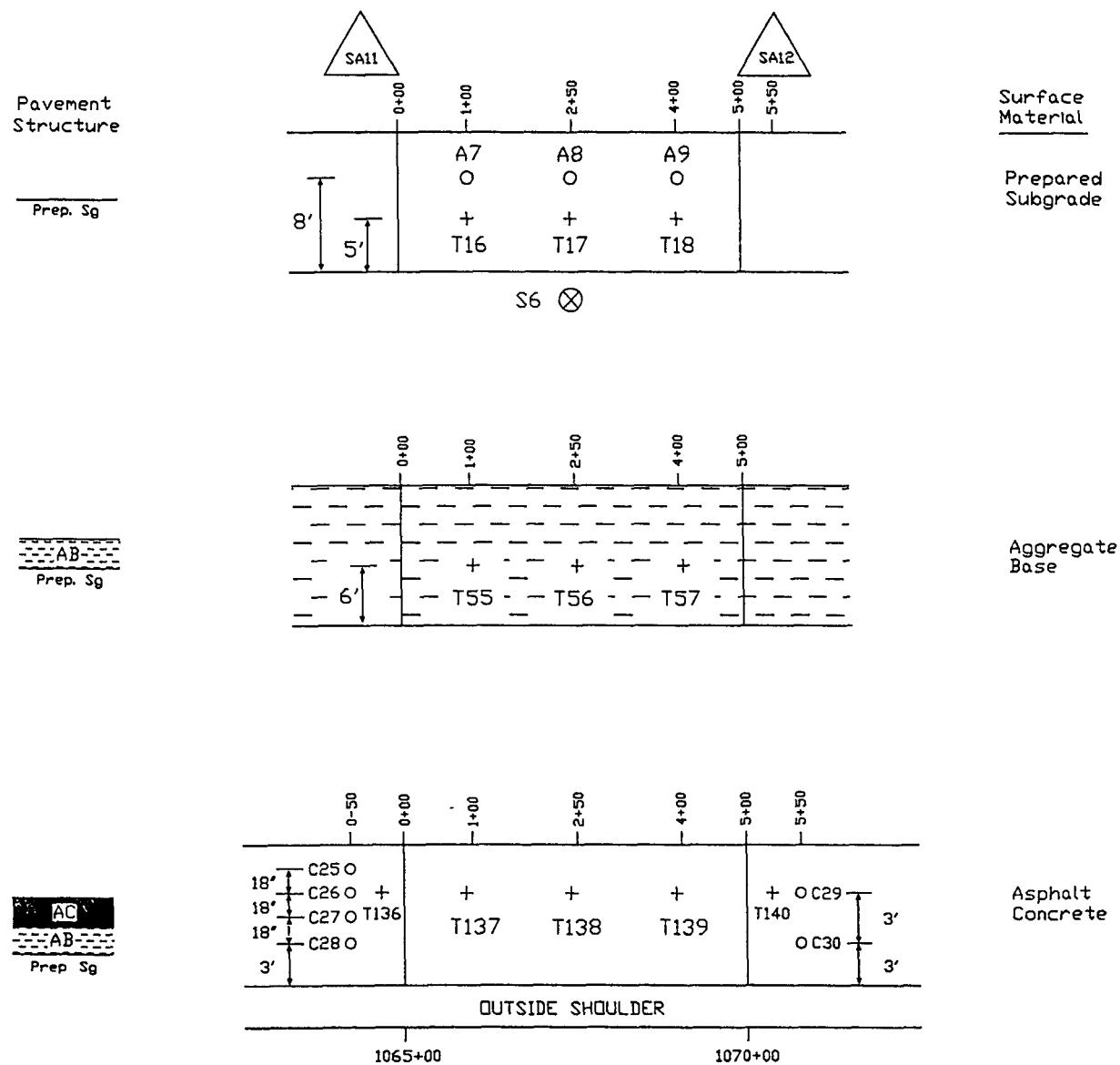
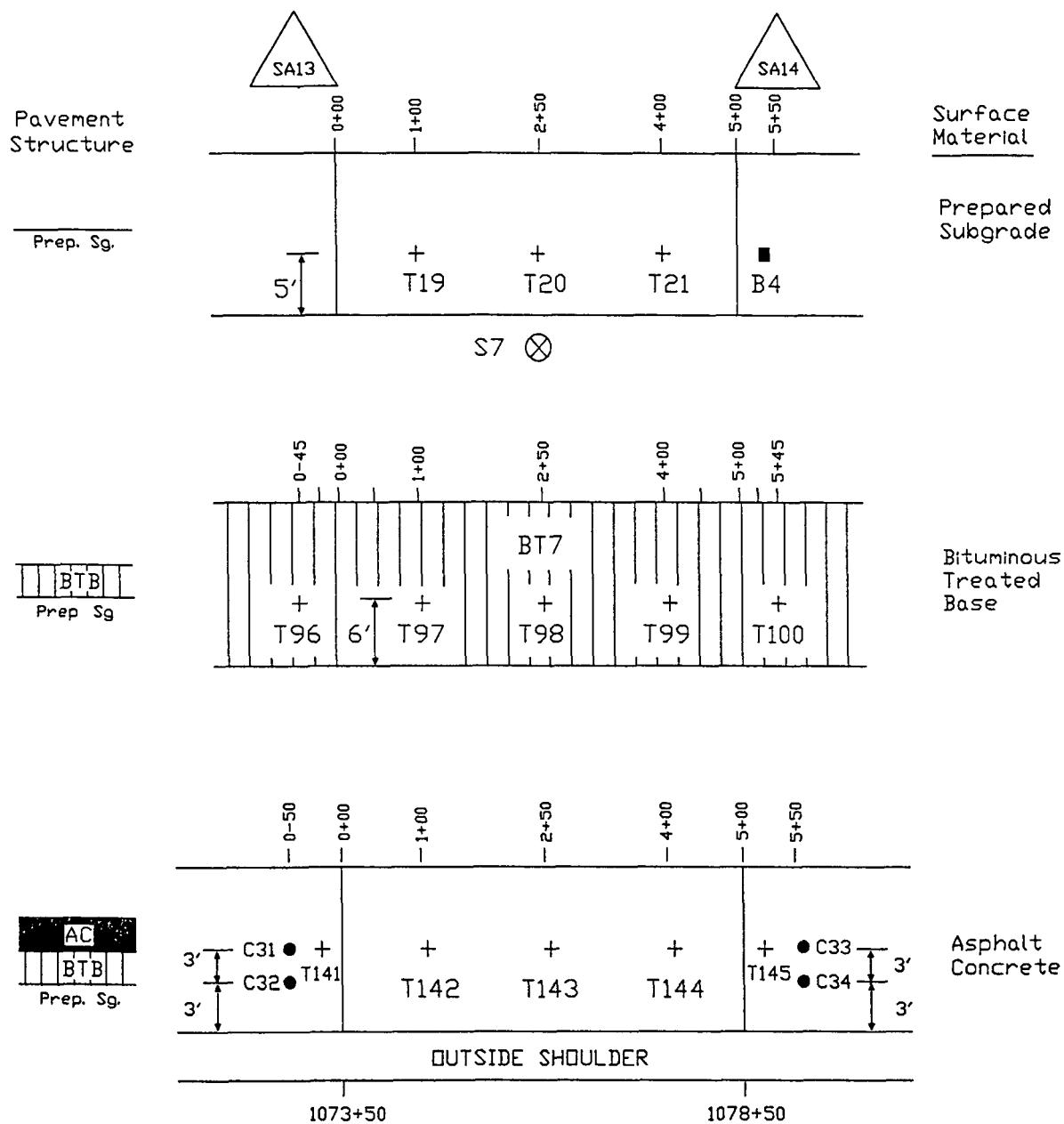


Figure 11. Sampling and test plan for test section 040119, SPS-1 Arizona.



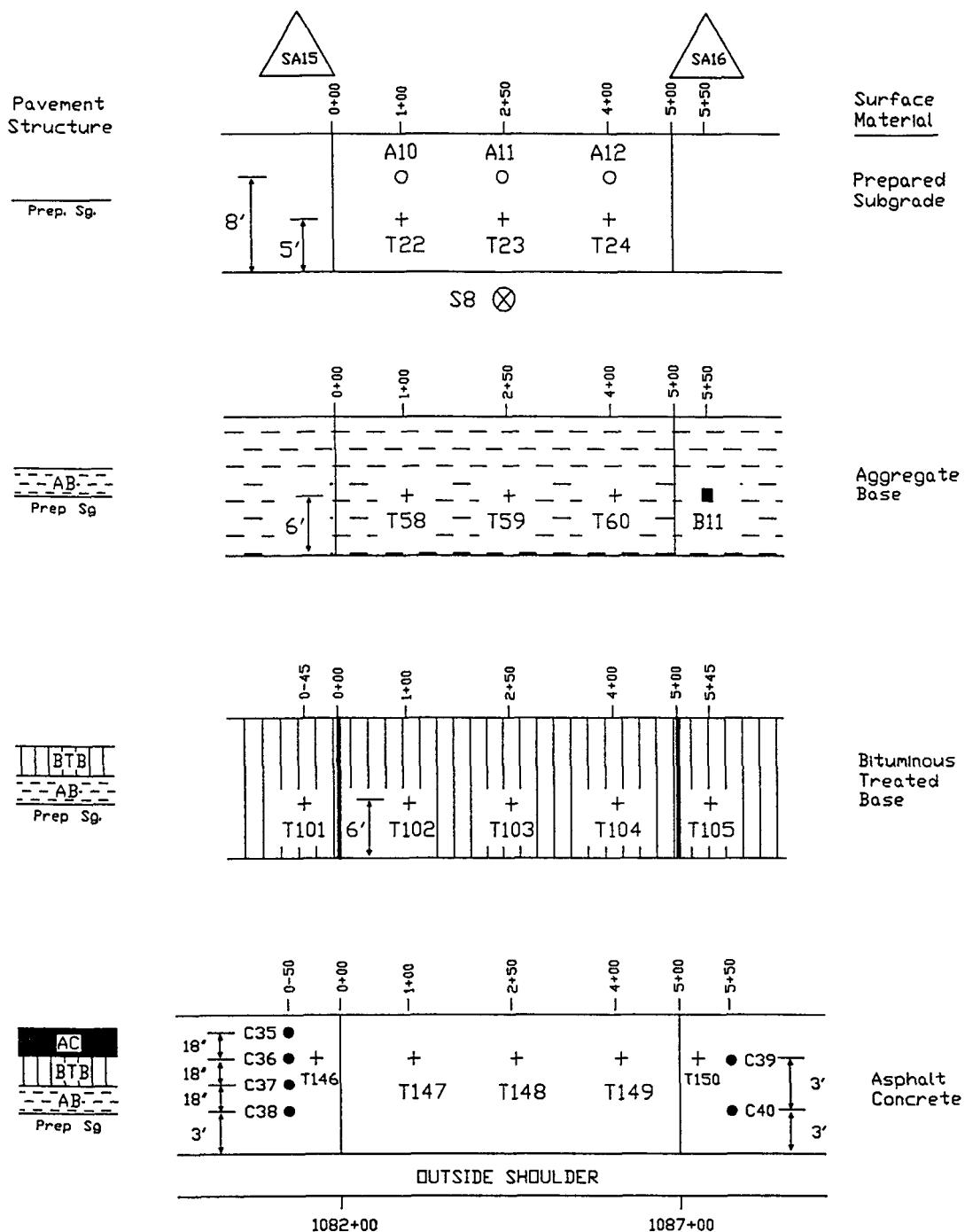
S6 - 20' shoulder probe  
A7-A9 - Thinwall tube samples of subgrade  
T16-T18 - Moisture-density tests on subgrade  
T55-T57 - Moisture-density tests on AB  
T136-T140 - Density tests on AC  
C25-C30 - Cores of AC surface

Figure 12. Sampling and test plan for test section 040114, SPS-1 Arizona.



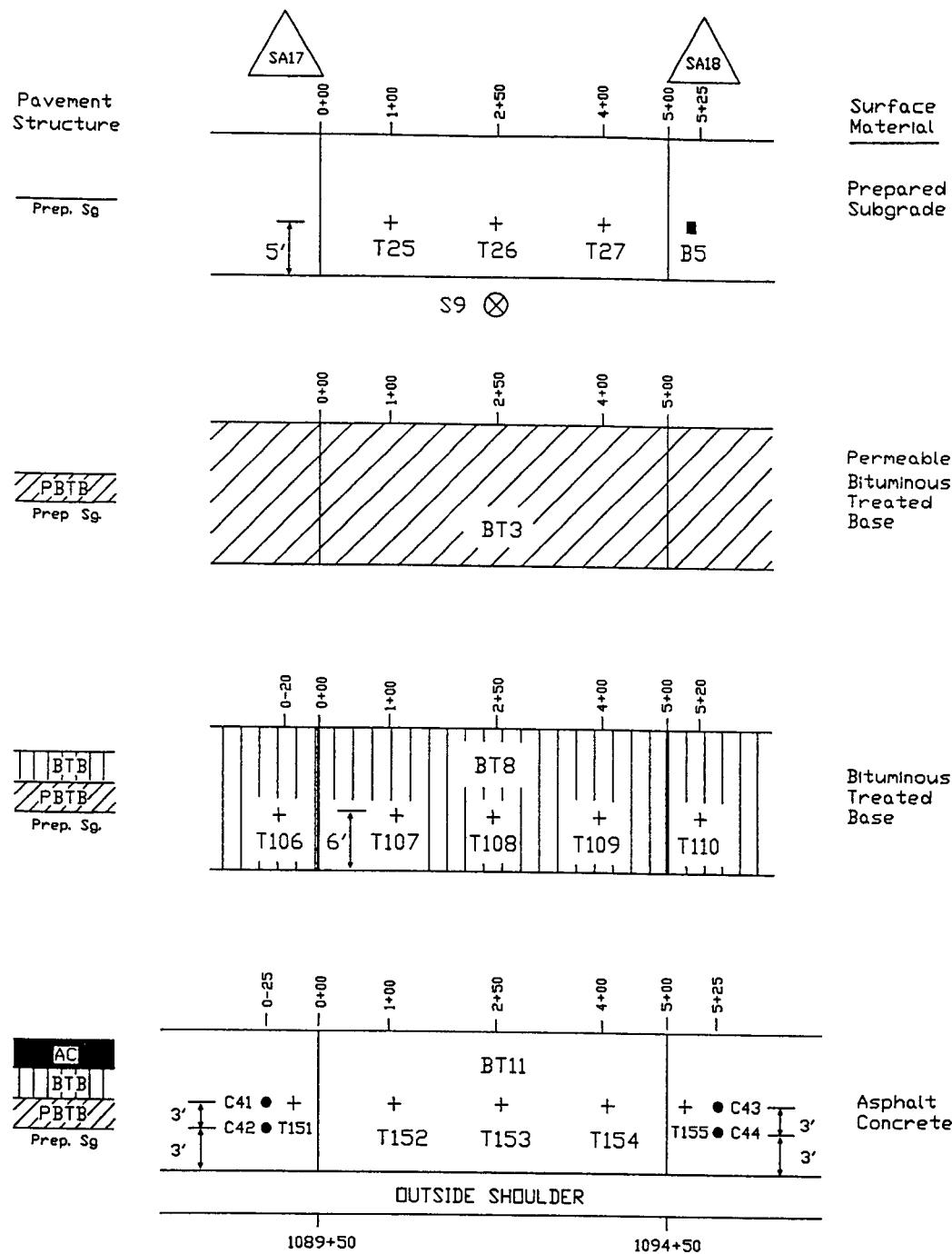
S7 - 20' shoulder probe  
 T19-T21 - Moisture-density tests on subgrade  
 B4 - Bulk sample of subgrade  
 T96-T100 - Density tests on BTB  
 BT7 - Bulk sample of BTB  
 T141-T145 - Density tests on AC  
 C31-C34 - Cores of AC surface and BTB layer

Figure 13. Sampling and test plan for test section 040116, SPS-1 Arizona.



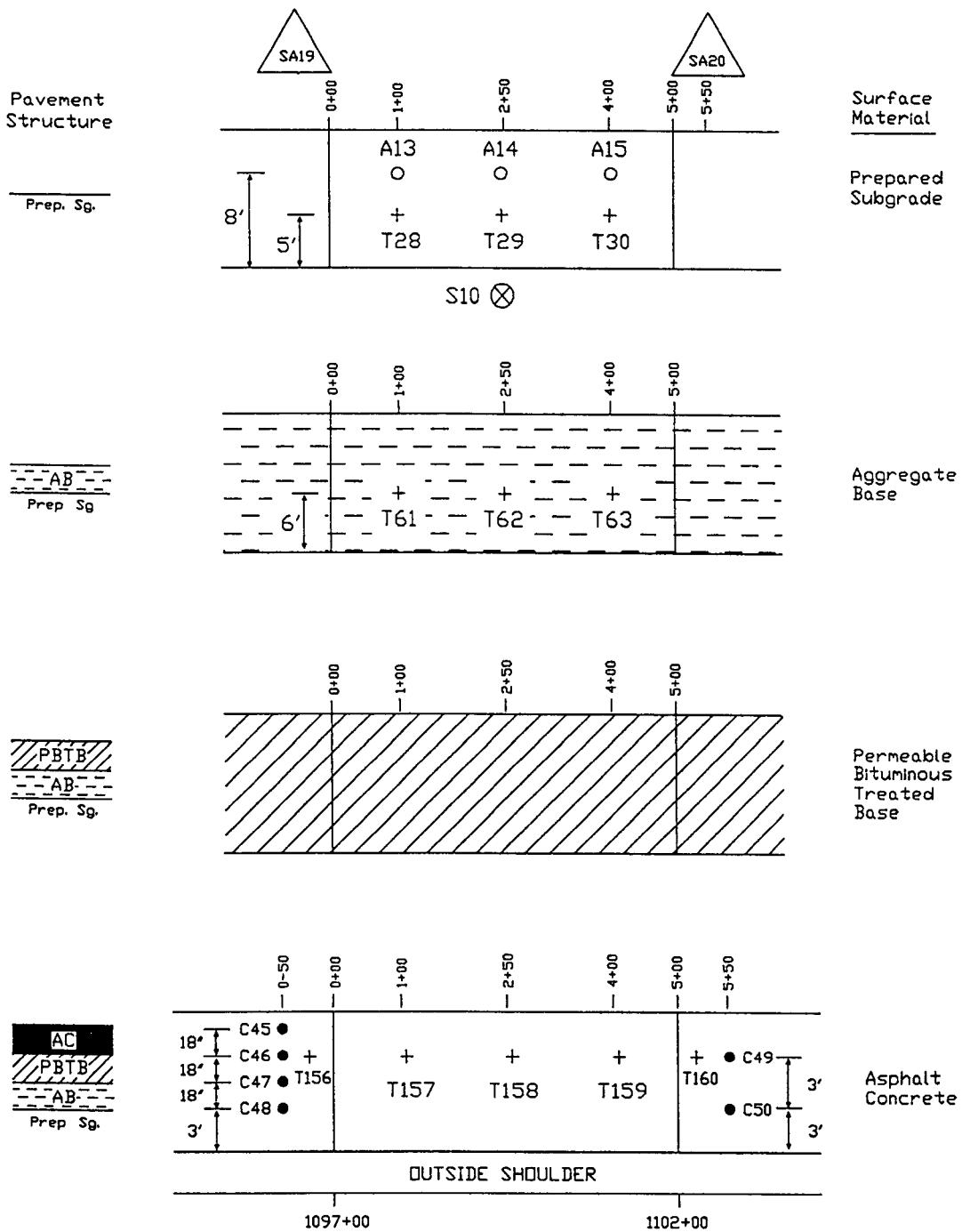
S8 - 20' shoulder probe  
 A10-A12 - Thinwall tube samples of subgrade  
 T22-T24 - Moisture-density tests on subgrade  
 T58-T60 - Moisture-density tests on AB  
 B11 - Bulk sample of AB  
 T101-T105 - Density tests on AC  
 T146-T150 - Density tests on AC  
 C35-C40 - Cores of AC surface and BTB layer

Figure 14. Sampling and test plan for test section 040118, SPS-1 Arizona.



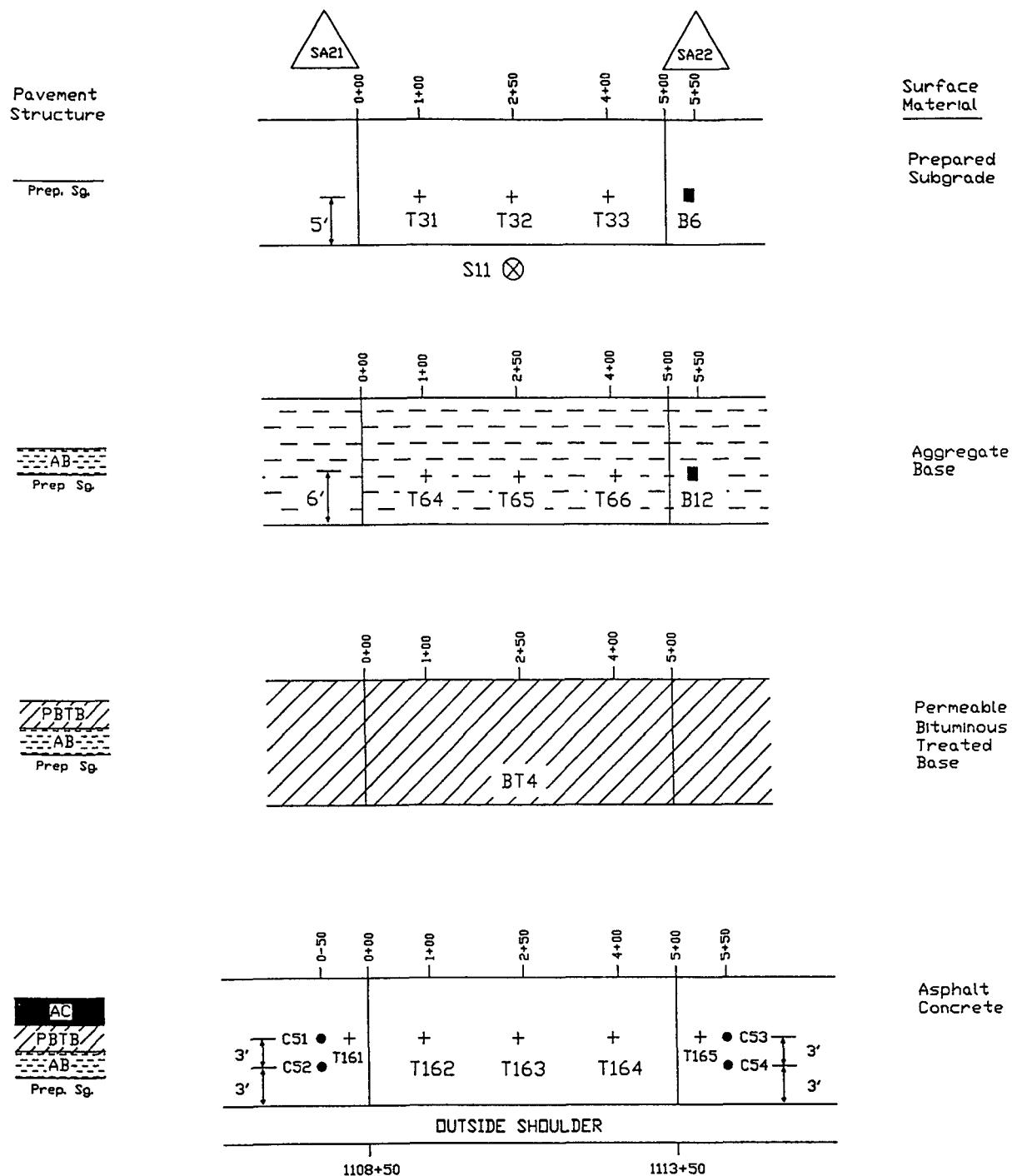
S9 - 20' shoulder probe  
 T25-T27 - Moisture-density tests on subgrade  
 B5 - Bulk sample of subgrade  
 BT3 - Bulk sample of PBTB  
 T106-T110 - Density tests on BTB  
 BT8 - Bulk sample of BTB  
 T151-T155 - Density tests on AC  
 BT11 - Bulk sample of AC  
 C41-C44 - Cores of AC surface, BTB and PBTB layers

Figure 15. Sampling and test plan for test section 040122, SPS-1 Arizona.



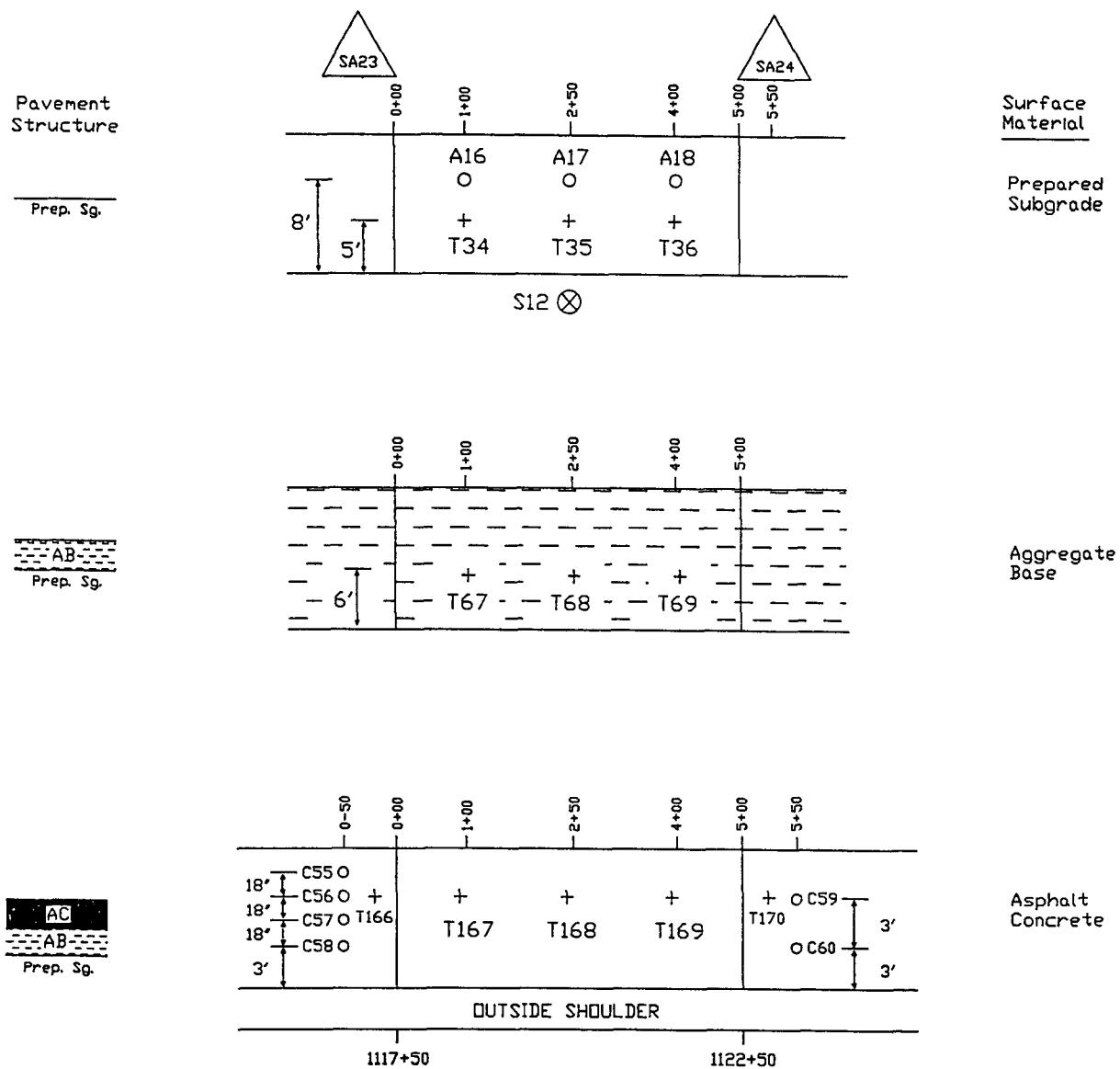
S10 - 20' shoulder probe  
 A13-A15 - Thinwall tube samples of subgrade  
 T28-T30 - Moisture-density tests on subgrade  
 T61-T63 - Moisture-density tests on AB  
 T156-T160 - Density tests on AC  
 C45-C50 - Cores of AC surface BTB layer

Figure 16. Sampling and test plan for test section 040121, SPS-1 Arizona.



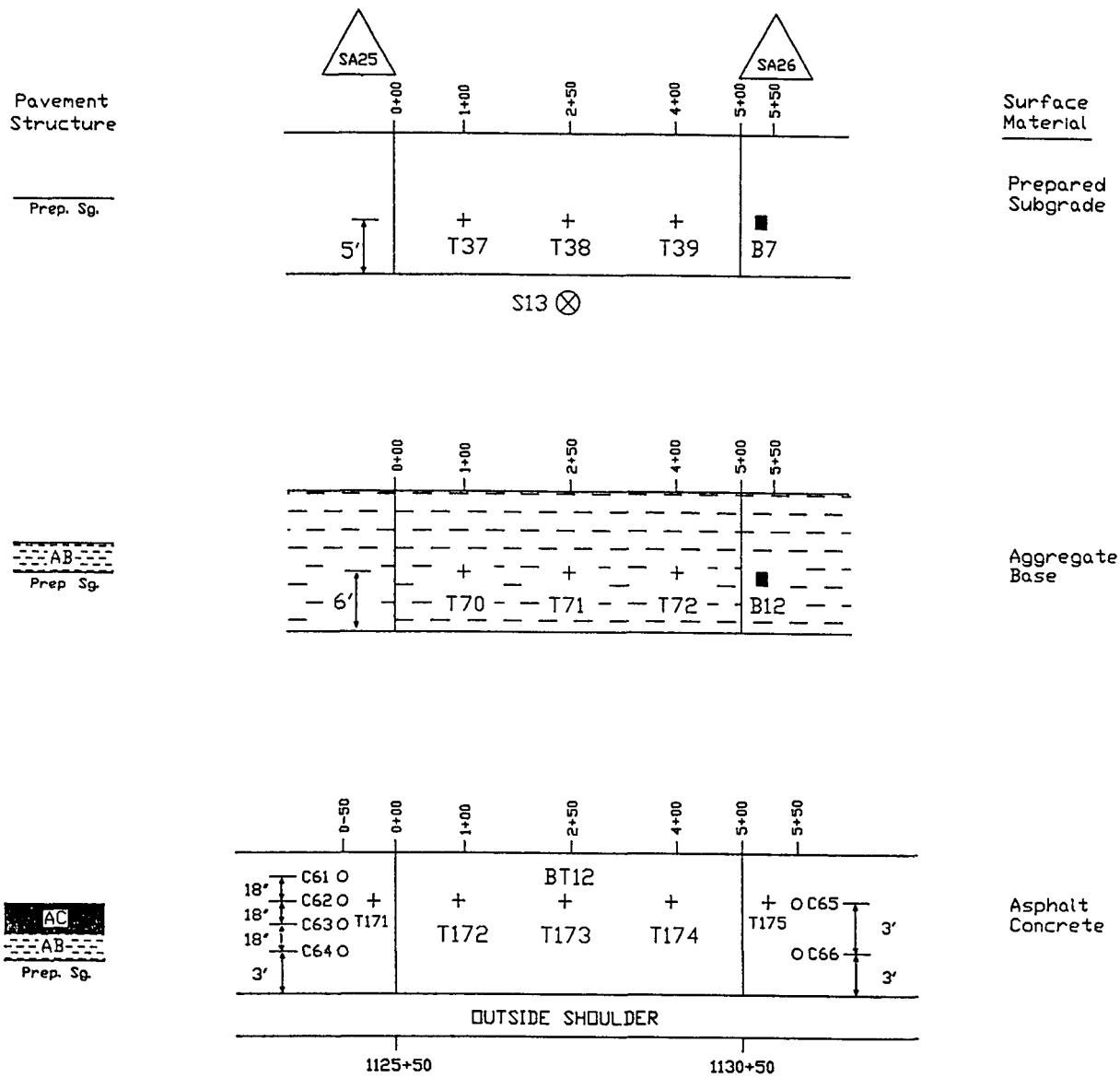
S11 - 20' shoulder probe  
T31-T33 - Moisture-density tests on subgrade  
B6 - Bulk sample of subgrade  
T64-T66 - Moisture-density tests on AB  
B12 - Bulk sample of AB  
BT4 - Bulk sample of PBTB  
T161-T165 - Density tests on AC  
C51-C54 - Cores of AC surface and PBTB layer

Figure 17. Sampling and test plan for test section 040120, SPS-1 Arizona.



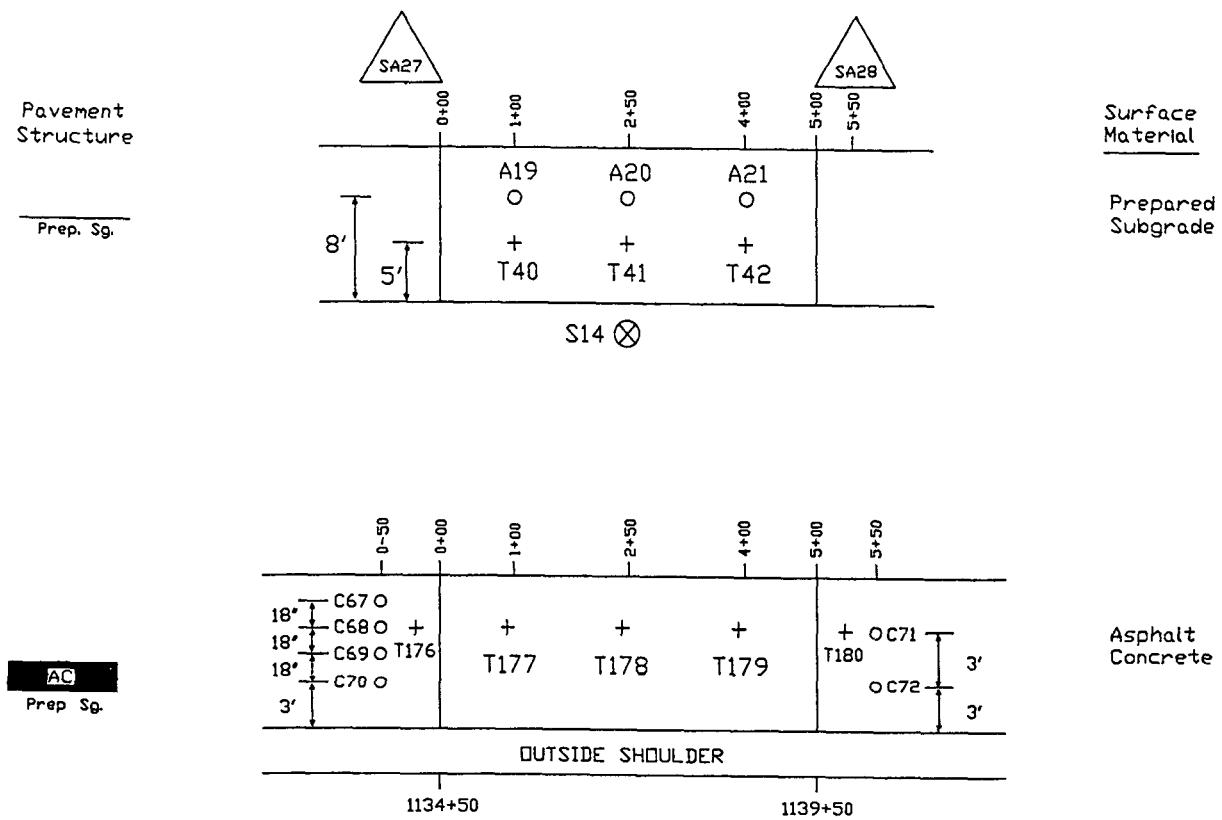
S12 - 20' shoulder probe  
 A16-A18 - Thinwall tube samples of subgrade  
 T34-T36 - Moisture-density tests on subgrade  
 T67-T69 - Moisture-density tests on AB  
 T166-T170 - Density tests on AC  
 C55-C60 - Cores of AC surface

Figure 18. Sampling and test plan for test section 040113, SPS-1 Arizona.



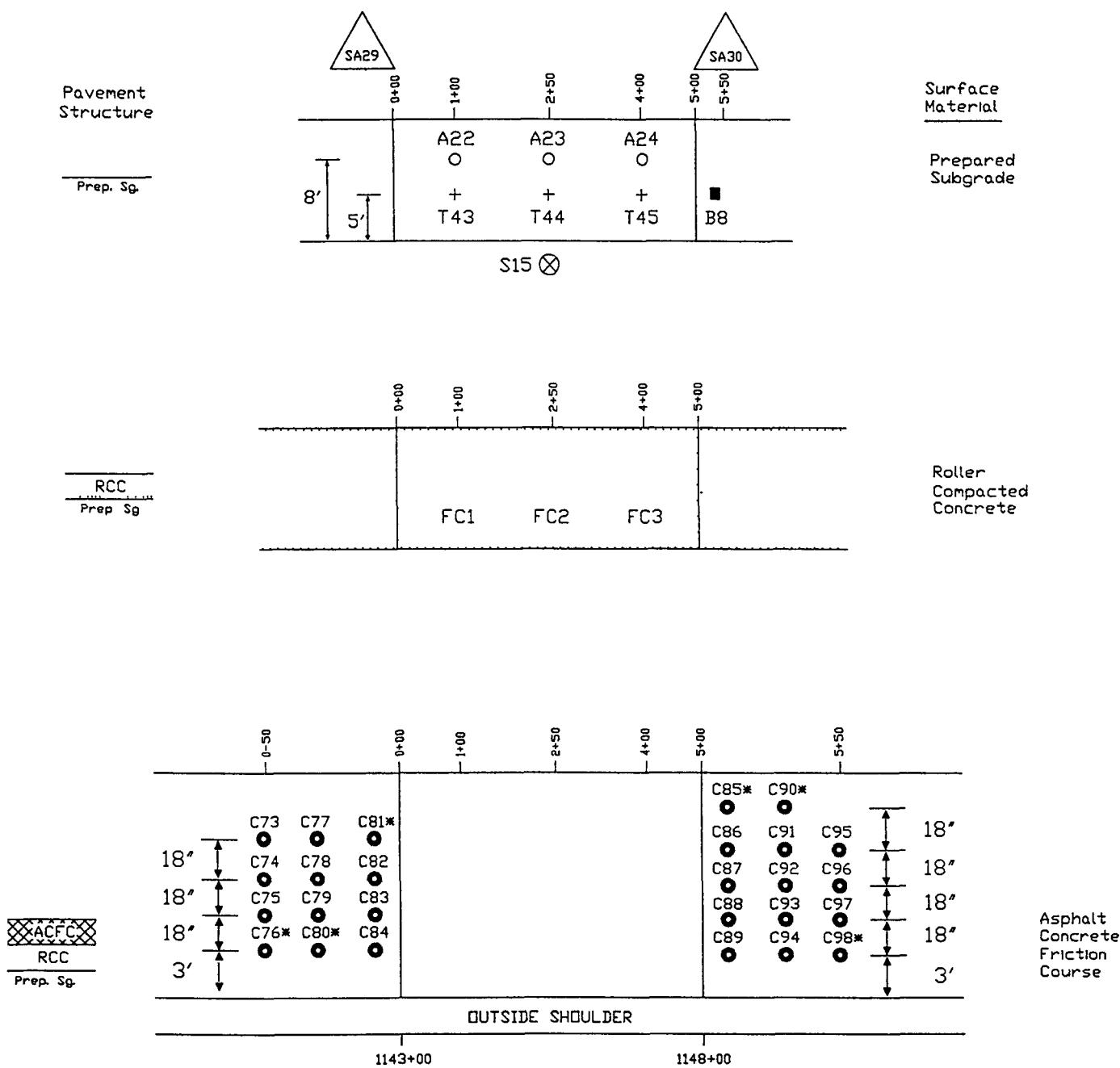
S13 - 20' shoulder probe  
 T37-T39 - Moisture-density tests on subgrade  
 B7 - Bulk sample of subgrade  
 T70-T72 - Moisture-density tests on AB  
 B12 - Bulk sample of AB  
 T171-T175 - Density tests on AC  
 BT12 - Bulk sample of AC  
 C61-C66 - Cores of AC surface

Figure 19. Sampling and test plan for test section 040126, SPS-1 Arizona.



S14 - 20' shoulder probe  
 A19-A21 - Thinwall samples of subgrade  
 T40-T42 - Moisture-density tests on subgrade  
 T176-T180 - Density tests on AC  
 C67-C72 - Cores of AC surface

Figure 20. Sampling and test plan for test section 040125, SPS-1 Arizona.



S15 - 20' shoulder probe

A22-A24 - Thinwall tube samples of subgrade

T43-T45 - Moisture-density tests on subgrade

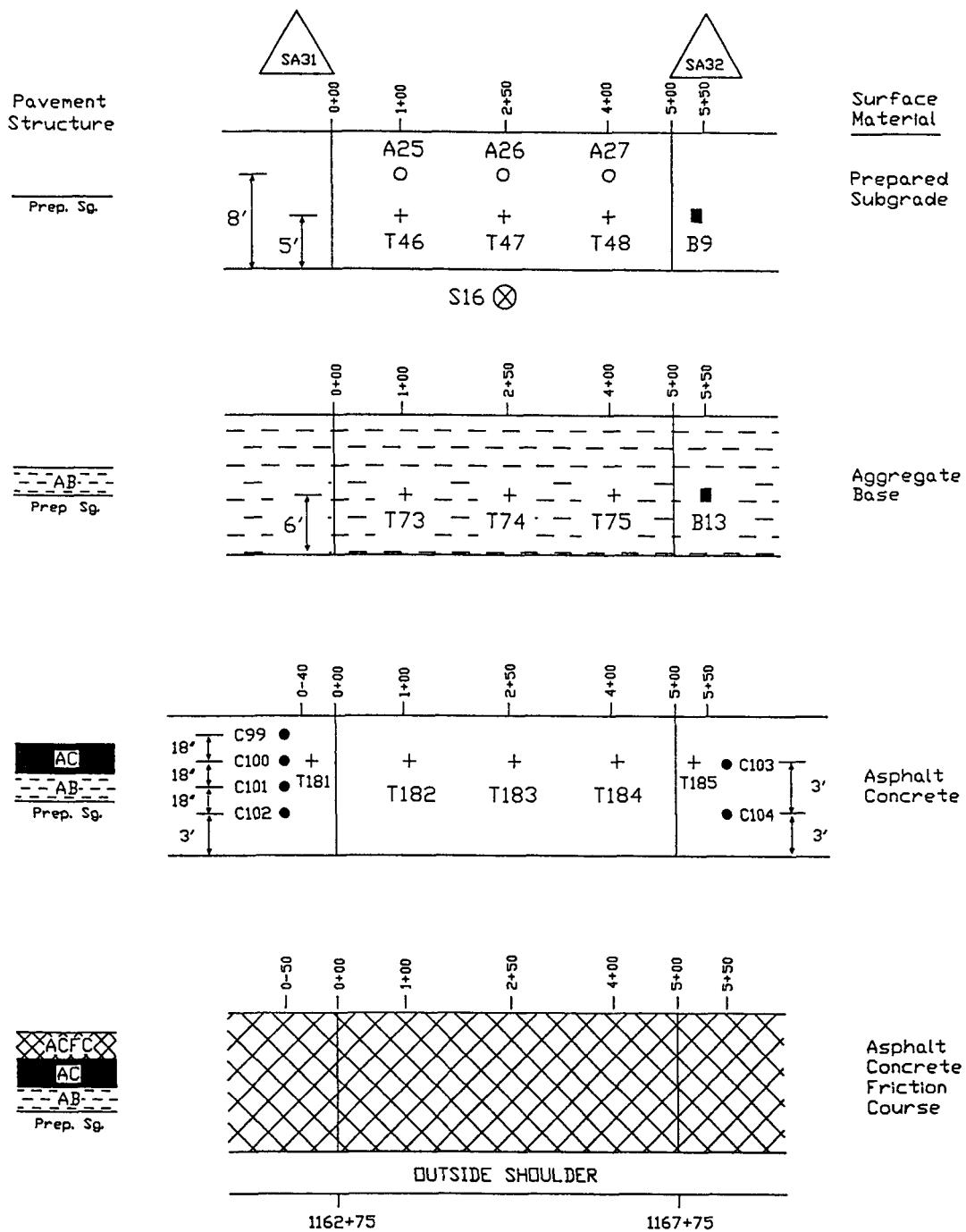
B8 - Bulk sample of subgrade

FC1-FC3 - Bulk samples of RCC

C73-C98 - Cores of RCC through ACFC layer

\*C76, C80, C81, C90, C98 - Cores of RCC 10-13 days after placement may be made on RCC surface if not overlaid

Figure 21. Sampling and test plan for test section 040127, SPS-1 Arizona.



S16 - 20' shoulder probe  
 A25-A27 - Thinwall tube samples of subgrade  
 T46-T48 - Moisture-density tests on subgrade  
 B9 - Bulk sample of subgrade  
 T73-T75 - Moisture-density tests on AB  
 B13 - Bulk sample of AB  
 T181-T185 - Density tests on AC  
 C99-C104 - Cores of AC layer

Figure 22. Sampling and test plan for test section 040128, SPS-1 Arizona.

Table 6. Field and laboratory test plan for Subgrade materials, SPS-1 Arizona.

| Test Name                        | SHRP Test Designation | SHRP Protocol    | Number of Tests | Material Source / Test Location          |
|----------------------------------|-----------------------|------------------|-----------------|--|
| Sieve Analysis                   | SS01                  | P51              | 9               | B1 - B9                                  |
| Hydrometer to 0.01 mm            | SS02                  | P42              | 9               | B1 - B9                                  |
| Atterberg Limits                 | SS03                  | P43              | 9               | B1 - B9                                  |
| Subgrade Classification and Type | SS04                  | P52              | 36              | A1 - A27, B1 - B9 see Note 1             |
| Moisture-Density Relations       | SS05                  | P55              | 9               | B1 - B9                                  |
| Resilient Modulus                | SS07                  | Ship to FHWA Lab | 9               | A2, A5, A8, A11, A14, A17, A20, A23, A26 |
| Unit Weight                      | SS08                  | P56              | 9               | B1 - B9                                  |
| Natural Moisture Content         | SS09                  | P49              | 9               | B1 - B9                                  |
| Unconfined Compression Strength  | SS10                  | P54              | 9               | A1, A4, A7, A10, A13, A16, A19, A22, A25 |
| Permeability                     | SS11                  | P57              | 6               | A3, A6, A9, A15, A21, A27                |
| In-Place Density and Moisture    |                       | SHRP-LTPP Method | 57              | B1-B9, T1-T48                            |
| Depth to Rigid Layer             |                       | SHRP-LTPP Method | 16              | S1-S16                                   |

Note 1. Visual-manual classification method only.

Table 7. Locations for thin-wall (Shelby) tube sampling of Subgrade, SPS-1 Arizona.

| Sample Location Designation | Station | Offset, feet    |                       | Test Section |
|-----------------------------|---------|-----------------|-----------------------|--------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |
| A1                          | 1020+00 | 4               | 8                     | 17           |
| A2                          | 1021+50 | 4               | 8                     | 17           |
| A3                          | 1023+00 | 4               | 8                     | 17           |
| A4                          | 1040+50 | 4               | 8                     | 23           |
| A5                          | 1042+00 | 4               | 8                     | 23           |
| A6                          | 1043+50 | 4               | 8                     | 23           |
| A7                          | 1066+00 | 4               | 8                     | 14           |
| A8                          | 1067+50 | 4               | 8                     | 14           |
| A9                          | 1069+00 | 4               | 8                     | 14           |
| A10                         | 1083+00 | 4               | 8                     | 18           |
| A11                         | 1084+50 | 4               | 8                     | 18           |
| A12                         | 1086+00 | 4               | 8                     | 18           |
| A13                         | 1098+00 | 4               | 8                     | 21           |
| A14                         | 1099+50 | 4               | 8                     | 21           |
| A15                         | 1101+00 | 4               | 8                     | 21           |
| A16                         | 1118+50 | 4               | 8                     | 13           |
| A17                         | 1120+00 | 4               | 8                     | 13           |
| A18                         | 1121+50 | 4               | 8                     | 13           |
| A19                         | 1135+50 | 4               | 8                     | 25           |
| A20                         | 1137+00 | 4               | 8                     | 25           |
| A21                         | 1138+50 | 4               | 8                     | 25           |
| A22                         | 1144+00 | 4               | 8                     | 27           |
| A23                         | 1145+50 | 4               | 8                     | 27           |
| A24                         | 1147+00 | 4               | 8                     | 27           |
| A25                         | 1163+75 | 4               | 8                     | 28           |
| A26                         | 1165+25 | 4               | 8                     | 28           |
| A27                         | 1166+75 | 4               | 8                     | 28           |

Table 8. Locations of prepared Subgrade bulk sampling, SPS-1 Arizona.

| Sample Location Designation | Station | Offset, feet    |                       | Test Section | Sample Area |
|-----------------------------|---------|-----------------|-----------------------|--------------|-------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |             |
| B1                          | 1016+50 | 7               | 5                     | 15           | 2           |
| B2                          | 1034+00 | 7               | 5                     | 24           | 6           |
| B3                          | 1058+50 | 7               | 5                     | 19           | 10          |
| B4                          | 1079+00 | 7               | 5                     | 16           | 14          |
| B5                          | 1095+00 | 7               | 5                     | 22           | 18          |
| B6                          | 1114+00 | 7               | 5                     | 20           | 22          |
| B7                          | 1131+00 | 7               | 5                     | 26           | 26          |
| B8                          | 1148+50 | 7               | 5                     | 27           | 30          |
| B9                          | 1168+25 | 7               | 5                     | 28           | 32          |

Table 9. Locations for in-place density and moisture tests on prepared Subgrade, SPS-1 Arizona.

| Sample Location Designation | Station | Offset, feet    |                       | Test Section |
|-----------------------------|---------|-----------------|-----------------------|--------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |
| T1                          | 1012+00 | 7               | 5                     | 15           |
| T2                          | 1013+50 | 7               | 5                     | 15           |
| T3                          | 1015+00 | 7               | 5                     | 15           |
| T4                          | 1020+00 | 7               | 5                     | 17           |
| T5                          | 1021+50 | 7               | 5                     | 17           |
| T6                          | 1023+00 | 7               | 5                     | 17           |
| T7                          | 1029+50 | 7               | 5                     | 24           |
| T8                          | 1031+00 | 7               | 5                     | 24           |
| T9                          | 1032+50 | 7               | 5                     | 24           |
| T10                         | 1040+50 | 7               | 5                     | 23           |
| T11                         | 1042+00 | 7               | 5                     | 23           |
| T12                         | 1043+50 | 7               | 5                     | 23           |
| T13                         | 1054+00 | 7               | 5                     | 19           |
| T14                         | 1055+50 | 7               | 5                     | 19           |
| T15                         | 1057+00 | 7               | 5                     | 19           |
| T16                         | 1066+00 | 7               | 5                     | 14           |
| T17                         | 1067+50 | 7               | 5                     | 14           |
| T18                         | 1069+00 | 7               | 5                     | 14           |
| T19                         | 1074+50 | 7               | 5                     | 16           |
| T20                         | 1076+00 | 7               | 5                     | 16           |
| T21                         | 1077+50 | 7               | 5                     | 16           |
| T22                         | 1083+00 | 7               | 5                     | 18           |
| T23                         | 1084+50 | 7               | 5                     | 18           |
| T24                         | 1086+00 | 7               | 5                     | 18           |
| T25                         | 1090+50 | 7               | 5                     | 22           |
| T26                         | 1092+00 | 7               | 5                     | 22           |
| T27                         | 1093+50 | 7               | 5                     | 22           |
| T28                         | 1098+00 | 7               | 5                     | 21           |
| T29                         | 1099+50 | 7               | 5                     | 21           |
| T30                         | 1101+00 | 7               | 5                     | 21           |

Table 9. Locations for in-place density and moisture tests on prepared Subgrade (Contd.).

| Sample Location Designation | Station | Offset, feet    |                       | Test Section |
|-----------------------------|---------|-----------------|-----------------------|--------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |
| T31                         | 1109+50 | 7               | 5                     | 20           |
| T32                         | 1111+00 | 7               | 5                     | 20           |
| T33                         | 1112+50 | 7               | 5                     | 20           |
| T34                         | 1118+50 | 7               | 5                     | 13           |
| T35                         | 1120+00 | 7               | 5                     | 13           |
| T36                         | 1121+50 | 7               | 5                     | 13           |
| T37                         | 1126+50 | 7               | 5                     | 26           |
| T38                         | 1128+00 | 7               | 5                     | 26           |
| T39                         | 1129+50 | 7               | 5                     | 26           |
| T40                         | 1135+50 | 7               | 5                     | 25           |
| T41                         | 1137+00 | 7               | 5                     | 25           |
| T42                         | 1138+50 | 7               | 5                     | 25           |
| T43                         | 1144+00 | 7               | 5                     | 27           |
| T44                         | 1145+50 | 7               | 5                     | 27           |
| T45                         | 1147+00 | 7               | 5                     | 27           |
| T46                         | 1163+75 | 7               | 5                     | 28           |
| T47                         | 1165+25 | 7               | 5                     | 28           |
| T48                         | 1166+75 | 7               | 5                     | 28           |

Table 10. Location of 20' deep shoulder probes, SPS-1 Arizona.

| Sample<br>Location<br>Designation | Station | Offset, feet    |                          | Test<br>Section |
|-----------------------------------|---------|-----------------|--------------------------|-----------------|
|                                   |         | Center Line, Rt | Outside Lane<br>Edge, Lt |                 |
| S1                                | 1013+50 | 18              | 6                        | 15              |
| S2                                | 1021+50 | 18              | 6                        | 17              |
| S3                                | 1031+00 | 18              | 6                        | 24              |
| S4                                | 1042+00 | 18              | 6                        | 23              |
| S5                                | 1055+50 | 18              | 6                        | 19              |
| S6                                | 1067+50 | 18              | 6                        | 14              |
| S7                                | 1076+00 | 18              | 6                        | 16              |
| S8                                | 1084+50 | 18              | 6                        | 18              |
| S9                                | 1092+00 | 18              | 6                        | 22              |
| S10                               | 1099+50 | 18              | 6                        | 21              |
| S11                               | 1111+00 | 18              | 6                        | 20              |
| S12                               | 1120+00 | 18              | 6                        | 13              |
| S13                               | 1128+00 | 18              | 6                        | 26              |
| S14                               | 1137+00 | 18              | 6                        | 25              |
| S15                               | 1145+50 | 18              | 6                        | 27              |
| S16                               | 1165+25 | 18              | 6                        | 28              |

Table 11. Field and laboratory test plan for Aggregate Base materials, SPS-1 Arizona.

| Test Name                     | SHRP Test Designation | SHRP Protocol    | Number of Tests | Material Source / Test Location |
|-------------------------------|-----------------------|------------------|-----------------|---------------------------------|
| Particle Size Analysis        | UG01                  | P41              | 5               | B10, B11, B12, B13, B14         |
| Sieve Analysis (washed)       | UG02                  | P41              | 5               | B10, B11, B12, B13, B14         |
| Atterberg Limits              | UG04                  | P43              | 5               | B10, B11, B12, B13, B14         |
| Moisture-Density Relations    | UG05                  | P44              | 5               | B10, B11, B12, B13, B14         |
| Resilient Modulus             | UG07                  | Ship to FHWA lab | 5               | B10, B11, B12, B13, B14         |
| Classification                | UG08                  | P47              | 5               | B10, B11, B12, B13, B14         |
| Permeability                  | UG09                  | P48              | 5               | B10, B11, B12, B13, B14         |
| Natural Moisture Content      | UG10                  | P49              | 5               | B10, B11, B12, B13, B14         |
| In-Place Density and Moisture |                       | SHRP-LTPP Method | 32              | T49 - T75, B10 - B14            |

Table 12. Bulk sampling of uncompacted Aggregate Base, SPS-1 Arizona.

| Sample Location Designation | Station | Offset, feet    |                       | Test Section | Sample Area |
|-----------------------------|---------|-----------------|-----------------------|--------------|-------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |             |
| B10                         | 1058+50 | 6               | 6                     | 19           | 10          |
| B11                         | 1087+50 | 6               | 6                     | 18           | 16          |
| B12                         | 1114+00 | 6               | 6                     | 20           | 22          |
| B13                         | 1131+00 | 6               | 6                     | 26           | 26          |
| B14                         | 1168+25 | 6               | 6                     | 28           | 32          |

Table 13. Locations for in-place moisture and density measurements on compacted Aggregate Base, SPS-1 Arizona.

| Sample Location Designation | Station | Offset, feet    |                       | Test Section |
|-----------------------------|---------|-----------------|-----------------------|--------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |
| T49                         | 1020+00 | 6               | 6                     | 17           |
| T50                         | 1021+50 | 6               | 6                     | 17           |
| T51                         | 1023+00 | 6               | 6                     | 17           |
| T52                         | 1054+00 | 6               | 6                     | 19           |
| T53                         | 1055+50 | 6               | 6                     | 19           |
| T54                         | 1057+00 | 6               | 6                     | 19           |
| T55                         | 1066+00 | 6               | 6                     | 14           |
| T56                         | 1067+50 | 6               | 6                     | 14           |
| T57                         | 1069+00 | 6               | 6                     | 14           |
| T58                         | 1083+00 | 6               | 6                     | 18           |
| T59                         | 1084+50 | 6               | 6                     | 18           |
| T60                         | 1086+00 | 6               | 6                     | 18           |
| T61                         | 1098+00 | 6               | 6                     | 21           |
| T62                         | 1099+50 | 6               | 6                     | 21           |
| T63                         | 1101+00 | 6               | 6                     | 21           |
| T64                         | 1109+50 | 6               | 6                     | 20           |
| T65                         | 1111+00 | 6               | 6                     | 20           |
| T66                         | 1112+50 | 6               | 6                     | 20           |
| T67                         | 1118+50 | 6               | 6                     | 13           |
| T68                         | 1120+00 | 6               | 6                     | 13           |
| T69                         | 1121+50 | 6               | 6                     | 13           |
| T70                         | 1126+50 | 6               | 6                     | 26           |
| T71                         | 1128+00 | 6               | 6                     | 26           |
| T72                         | 1129+50 | 6               | 6                     | 26           |
| T73                         | 1163+75 | 6               | 6                     | 28           |
| T74                         | 1165+25 | 6               | 6                     | 28           |
| T75                         | 1166+75 | 6               | 6                     | 28           |

Table 14. Field and laboratory test plan for Permeable Bituminous Treated Base (PBTB) materials, SPS-1 Arizona.

| Test Name                                  | SHRP Test Designation | SHRP Protocol    | Number of Tests | Material Source / Test Location |
|--|-----------------------|------------------|-----------------|---------------------------------|
| Core Examination/Thickness                 | AC01                  | P01              | 28              | C11-C24, C41-C54 (Note 1)       |
| Bulk Specific Gravity                      | AC02                  | P02              | 28              | C11-C24, C41-C54                |
| Maximum Specific Gravity                   | AC03                  | P03              | 4               | BT1-BT4 (Note 2)                |
| Asphalt Content (Extraction)               | AC04                  | P04              | 4               | BT1-BT4                         |
| Moisture Susceptibility                    | AC05                  | P05              | 4               | BT1-BT4                         |
| Permeability/Flow                          | AC08                  | P08              | 1               | BT3                             |
| Resilient Modulus                          | AC07                  | Ship to FHWA Lab | 2               | C15-C17, C45-C47                |
| Indirect Tensile Strength                  | AC07                  | Ship to FHWA Lab | 8               | C15-C18, C45-C48                |
| Extracted Aggregate                        |                       |                  |                 |                                 |
| Specific Gravity Coarse Aggregate          | AG01                  | P11              | 4               | BT1, BT2, BT3, BT4              |
| Specific Gravity Fine Aggregate            | AG02                  | P12              | 4               | BT1, BT2, BT3, BT4              |
| Type and Class Coarse Aggregate            | AG03                  | P13              | 4               | BT1, BT2, BT3, BT4              |
| Type and Class Fine Aggregate              | AG03                  | P13              | 4               | BT1, BT2, BT3, BT4              |
| Aggregate Gradation                        | AG04                  | P14              | 4               | BT1, BT2, BT3, BT4              |
| NAA Test for Fine Aggregate Particle Shape | AG05                  | P14A             | 4               | BT1, BT2, BT3, BT4              |
| Coarse Aggregate Shape                     | AG06                  | P14B             | 4               | BT1, BT2, BT3, BT4              |
| Asphalt Cement                             |                       |                  |                 |                                 |
| Abson Recovery                             | AE01                  | P21              | 4               | BT1, BT2, BT3, BT4              |
| Penetration at 50F, 77F, 90F               | AE02                  | P22              | 4               | BT1, BT2, BT3, BT4              |
| Specific Gravity (60F)                     | AE03                  | P23              | 4               | BT1, BT2, BT3, BT4              |
| Viscosity at 77F                           | AE04                  | P24              | 4               | BT1, BT2, BT3, BT4              |
| Viscosity at 140F, 275F                    | AE05                  | P25              | 4               | BT1, BT2, BT3, BT4              |

#### Notes

1. Core locations are shown in Table 18.
2. Bulk sampling locations are shown in Figures 9, 11, 15, and 17.

Table 15. Field and laboratory test plan for Bituminous Treated Base materials, SPS-1 Arizona.

| Test Name                                  | SHRP Test Designation | SHRP Protocol     | Number of Tests | Material Source / Test Location |
|--|-----------------------|-------------------|-----------------|---------------------------------|
| Core Examination/Thickness                 | AC01                  | P01               | 34              | C1-C20, C31-C44 (Note 1)        |
| Bulk Specific Gravity                      | AC02                  | P02               | 34              | C1-C20, C31-C44                 |
| Maximum Specific Gravity                   | AC03                  | P03               | 4               | BT5-BT8 (Note 2)                |
| Asphalt Content (Extraction)               | AC04                  | P04               | 4               | BT5-BT8                         |
| Moisture Susceptibility                    | AC05                  | P05               | 1               | BT7                             |
| Resilient Modulus                          | AC07                  | Ship to FHWA Lab  | 3               | C5-C7, C15-C17, C35-C37         |
| Indirect Tensile Strength                  | AC07                  | Ship to FHWA Lab  | 12              | C5-C8, C15-C18, C35-C38         |
| In-Place Density                           |                       | SHRP- LTPP Method | 35              | T76-T110                        |
| Extracted Aggregate                        |                       |                   |                 |                                 |
| Specific Gravity Coarse Aggregate          | AG01                  | P11               | 4               | BT5, BT6, BT7, BT8              |
| Specific Gravity Fine Aggregate            | AG02                  | P12               | 4               | BT5, BT6, BT7, BT8              |
| Type and Class Coarse Aggregate            | AG03                  | P13               | 4               | BT5, BT6, BT7, BT8              |
| Type and Class Fine Aggregate              | AG03                  | P13               | 4               | BT5, BT6, BT7, BT8              |
| Aggregate Gradation                        | AG04                  | P14               | 4               | BT5, BT6, BT7, BT8              |
| NAA Test for Fine Aggregate Particle Shape | AG05                  | P14A              | 4               | BT5, BT6, BT7, BT8              |
| Coarse Aggregate Particle Shape            | AG06                  | P14A              | 4               | BT5, BT6, BT7, BT8              |
| Asphalt Cement                             |                       |                   |                 |                                 |
| Abson Recovery                             | AE01                  | P21               | 4               | BT5, BT6, BT7, BT8              |
| Penetration @ 50F, 77F, 90F                | AE02                  | P22               | 4               | BT5, BT6, BT7, BT8              |
| Specific Gravity (60F)                     | AE03                  | P23               | 4               | BT5, BT6, BT7, BT8              |
| Viscosity @ 77F                            | AE04                  | P24               | 4               | BT5, BT6, BT7, BT8              |
| Viscosity @ 140F, 275F                     | AE05                  | P25               | 4               | BT5, BT6, BT7, BT8              |
| Asphalt Cement (from plant)                |                       |                   |                 |                                 |
| Penetration @ 50F, 77F, 90F                | AE02                  | P22               | 3               | BC1, BC2, BC3                   |
| Specific Gravity (60F)                     | AE03                  | P23               | 3               | BC1, BC2, BC3                   |
| Viscosity @ 77F                            | AE04                  | P24               | 3               | BC1, BC2, BC3                   |
| Viscosity @ 104F, 275F                     | AE05                  | P25               | 3               | BC1, BC2, BC3                   |

#### Notes

1. Core locations are shown in Table 18.
2. Bulk sampling locations are shown in Figures 7, 9, 13, 15.

Table 16. Locations for in-place density measurements on compacted Bituminous Treated Base.

| Sample Location Designation | Station | Offset, feet    |                       | Test Section |
|-----------------------------|---------|-----------------|-----------------------|--------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |
| T76                         | 1010+55 | 6               | 6                     | 15           |
| T77                         | 1012+00 | 6               | 6                     | 15           |
| T78                         | 1013+50 | 6               | 6                     | 15           |
| T79                         | 1015+00 | 6               | 6                     | 15           |
| T80                         | 1016+45 | 6               | 6                     | 15           |
| T81                         | 1018+55 | 6               | 6                     | 17           |
| T82                         | 1020+00 | 6               | 6                     | 17           |
| T83                         | 1021+50 | 6               | 6                     | 17           |
| T84                         | 1023+00 | 6               | 6                     | 17           |
| T85                         | 1024+45 | 6               | 6                     | 17           |
| T86                         | 1028+05 | 6               | 6                     | 24           |
| T87                         | 1029+50 | 6               | 6                     | 24           |
| T88                         | 1031+00 | 6               | 6                     | 24           |
| T89                         | 1032+50 | 6               | 6                     | 24           |
| T90                         | 1033+95 | 6               | 6                     | 24           |
| T91                         | 1039+05 | 6               | 6                     | 23           |
| T92                         | 1040+50 | 6               | 6                     | 23           |
| T93                         | 1042+00 | 6               | 6                     | 23           |
| T94                         | 1043+50 | 6               | 6                     | 23           |
| T95                         | 1044+95 | 6               | 6                     | 23           |
| T96                         | 1073+05 | 6               | 6                     | 16           |
| T97                         | 1074+50 | 6               | 6                     | 16           |
| T98                         | 1076+00 | 6               | 6                     | 16           |
| T99                         | 1077+50 | 6               | 6                     | 16           |
| T100                        | 1078+95 | 6               | 6                     | 16           |
| T101                        | 1081+55 | 6               | 6                     | 18           |
| T102                        | 1083+00 | 6               | 6                     | 18           |
| T103                        | 1084+50 | 6               | 6                     | 18           |
| T104                        | 1086+00 | 6               | 6                     | 18           |
| T105                        | 1087+45 | 6               | 6                     | 18           |
| T106                        | 1089+30 | 6               | 6                     | 22           |
| T107                        | 1090+50 | 6               | 6                     | 22           |
| T108                        | 1092+00 | 6               | 6                     | 22           |
| T109                        | 1093+50 | 6               | 6                     | 22           |
| T110                        | 1094+70 | 6               | 6                     | 22           |

Table 17. Field sampling and laboratory test plan for Asphalt Concrete surface materials, SPS-1 Arizona.

| Test Name                                  | SHRP Test Designation | SHRP Protocol     | No. of Tests | Material Source / Test Location  |
|--|-----------------------|-------------------|--------------|--|
| Core Examination/Thickness                 | AC01                  | P01               | 76           | C1-C72, C99-C104 (Note 1)  |
| Bulk Specific Gravity                      | AC02                  | P02               | 76           | C1-C72, C99-C104   |
| Maximum Specific Gravity                   | AC03                  | P03               | 4            | BT9-BT12 (Note 2)  |
| Asphalt Content (Extraction)               | AC04                  | P04               | 4            | BT9-BT12   |
| Moisture Susceptibility                    | AC05                  | P05               | 4            | BT9-BT12   |
| Creep Modulus                              | AC06                  | P06               | 2            | [C3, C23, C44], [C65, C71, C104]   |
| Resilient Modulus                          | AC07                  | Ship to FHWA Lab  | 9            | C5-C7, C15-C17, C25-C27, C35-C37, C45-C47, C55-C57, C61-C63, C67-C69, C99-C101 |
| Indirect Tensile Strength                  | AC07                  | Ship to FHWA Lab  | 36           | C5-C8, C15-C18, C25-C28, C35-C38, C45-C48, C55-C58, C61-C64, C67-C70, C99-C102 |
| In-Place Density                           |                       | SHRP- LTPP Method | 75           | T111-T185  |
| Extracted Aggregate                        |                       |                   |              |  |
| Bulk Specific Gravity of Coarse Aggregate  | AG01                  | P11               | 4            | BT9, BT10, BT11, BT12  |
| Bulk Specific Gravity of Fine Aggregate    | AG02                  | P12               | 4            | BT9, BT10, BT11, BT12  |
| Type and Class of Coarse Aggregate         | AG03                  | P13               | 4            | BT9, BT10, BT11, BT12  |
| Type and Class of Fine Aggregate           | AG03                  | P13               | 4            | BT9, BT10, BT11, BT12  |
| Aggregate Gradation                        | AG04                  | P14               | 4            | BT9, BT10, BT11, BT12  |
| NAA Test for Fine Aggregate Particle Shape | AG05                  | P14A              | 4            | BT9, BT10, BT11, BT12  |
| Coarse Aggregate Particle Shape            | AG06                  | P14B              | 4            | BT9, BT10, BT11, BT12  |
| Asphalt Cement                             |                       |                   |              |  |
| Abson Recovery                             | AE01                  | P21               | 4            | BT9, BT10, BT11, BT12  |
| Penetration @ 50F, 77F, 90F                | AE02                  | P22               | 4            | BT9, BT10, BT11, BT12  |
| Specific Gravity (60F)                     | AE03                  | P23               | 4            | BT9, BT10, BT11, BT12  |
| Viscosity @ 77F                            | AE04                  | P24               | 4            | BT9, BT10, BT11, BT12  |
| Viscosity @ 140F, 275F                     | AE05                  | P25               | 4            | BT9, BT10, BT11, BT12  |
| Asphalt Cement (from plant)                |                       |                   |              |  |
| Penetration @ 50F, 77F, 90F                | AE02                  | P22               | 3            | BC4, BC5, BC6 (Note 3)   |
| Specific Gravity (60F)                     | AE03                  | P23               | 3            | BC4, BC5, BC6  |
| Viscosity @ 77F                            | AE04                  | P24               | 3            | BC4, BC5, BC6  |
| Viscosity @ 140F, 275F                     | AE05                  | P25               | 3            | BC4, BC5, BC6  |

#### Notes

1. Core locations are shown in Table 18.
2. Bulk sampling locations are shown in Figures 7, 10, 15, 19.
3. If the same asphalt cement is used for the BTB and the AC then the tests on BC1-BC3 can be used for these tests.

Table 17. Field sampling and laboratory test plan for Asphalt Concrete surface materials, SPS-1 Arizona (contd.).

| Test Name  | SHRP Test Designation                    | SHRP Protocol | No. of Tests                   | Material Source / Test Location        |
|--|--|---------------|--------------------------------|--|
| Cores for SHRP Asphalt Research Program                        | Ship to SHRP Materials Reference Library |               | 24                             | CS1 - CS24                             |
| Asphalt samples for SHRP Asphalt Research Program              |  |               | 55 gallons<br>5 gal containers | Obtain from asphalt concrete mix plant |
| Aggregate samples for SHRP Asphalt Research Program            |  |               | 1,000 lbs<br>55 gal drums      |  |
| Bulk asphalt concrete sample for SHRP Asphalt Research Program |  |               | 200 lbs<br>5 gal containers    |  |

Table 18. Asphalt Concrete and bound base core locations, SPS-1 Arizona.

| Sample Location Designation | Station | Offset, feet    |                       | Test Section | Sample Area |
|-----------------------------|---------|-----------------|-----------------------|--------------|-------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |             |
| C1 <sup>2</sup>             | 1010+50 | 6               | 6                     | 15           | 1           |
| C2 <sup>2</sup>             | 1010+50 | 9               | 3                     | 15           | 1           |
| C3 <sup>2</sup>             | 1016+50 | 6               | 6                     | 15           | 2           |
| C4 <sup>2</sup>             | 1016+50 | 9               | 3                     | 15           | 2           |
| C5 <sup>2</sup>             | 1018+50 | 4.5             | 7.5                   | 17           | 3           |
| C6 <sup>2</sup>             | 1018+50 | 6               | 6                     | 17           | 3           |
| C7 <sup>2</sup>             | 1018+50 | 7.5             | 4.5                   | 17           | 3           |
| C8 <sup>2</sup>             | 1018+50 | 9               | 3                     | 17           | 3           |
| C9 <sup>2</sup>             | 1024+50 | 6               | 6                     | 17           | 4           |
| C10 <sup>2</sup>            | 1024+50 | 9               | 3                     | 17           | 4           |
| C11 <sup>4</sup>            | 1028+00 | 6               | 6                     | 24           | 5           |
| C12 <sup>4</sup>            | 1028+00 | 9               | 3                     | 24           | 5           |
| C13 <sup>4</sup>            | 1034+50 | 6               | 6                     | 24           | 6           |
| C14 <sup>4</sup>            | 1034+50 | 9               | 3                     | 24           | 6           |
| C15 <sup>4</sup>            | 1039+00 | 4.5             | 7.5                   | 23           | 7           |
| C16 <sup>4</sup>            | 1039+00 | 6               | 6                     | 23           | 7           |
| C17 <sup>4</sup>            | 1039+00 | 7.5             | 4.5                   | 23           | 7           |
| C18 <sup>4</sup>            | 1039+00 | 9               | 3                     | 23           | 7           |
| C19 <sup>4</sup>            | 1045+00 | 6               | 6                     | 23           | 8           |
| C20 <sup>4</sup>            | 1045+00 | 9               | 3                     | 23           | 8           |
| C21 <sup>3</sup>            | 1052+50 | 6               | 6                     | 19           | 9           |
| C22 <sup>3</sup>            | 1052+50 | 9               | 3                     | 19           | 9           |
| C23 <sup>3</sup>            | 1058+50 | 6               | 6                     | 19           | 10          |
| C24 <sup>3</sup>            | 1058+50 | 9               | 3                     | 19           | 10          |
| C25 <sup>1</sup>            | 1064+50 | 4.5             | 7.5                   | 14           | 11          |
| C26 <sup>1</sup>            | 1064+50 | 6               | 6                     | 14           | 11          |
| C27 <sup>1</sup>            | 1064+50 | 7.5             | 4.5                   | 14           | 11          |
| C28 <sup>1</sup>            | 1064+50 | 9               | 3                     | 14           | 11          |
| C29 <sup>1</sup>            | 1070+50 | 6               | 6                     | 14           | 12          |
| C30 <sup>1</sup>            | 1070+50 | 9               | 3                     | 14           | 12          |

1 - Cores of Surface only

2 - Cores of Surface and BTB

3 - Cores of Surface and PBTB

4 - Cores of Surface with BTB and PBTB

Table 18. Asphalt Concrete and bound base core locations, SPS-1 Arizona (Contd.).

| Sample Location Designation | Station | Offset, feet    |                       | Test Section | Sample Area |
|-----------------------------|---------|-----------------|-----------------------|--------------|-------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |             |
| C31 <sup>2</sup>            | 1073+00 | 6               | 6                     | 16           | 13          |
| C32 <sup>2</sup>            | 1073+00 | 9               | 3                     | 16           | 13          |
| C33 <sup>2</sup>            | 1079+00 | 6               | 6                     | 16           | 14          |
| C34 <sup>2</sup>            | 1079+00 | 9               | 3                     | 16           | 14          |
| C35 <sup>2</sup>            | 1081+50 | 4.5             | 7.5                   | 18           | 15          |
| C36 <sup>2</sup>            | 1081+50 | 6               | 6                     | 18           | 15          |
| C37 <sup>2</sup>            | 1081+50 | 7.5             | 4.5                   | 18           | 15          |
| C38 <sup>2</sup>            | 1081+50 | 9               | 3                     | 18           | 15          |
| C39 <sup>2</sup>            | 1087+50 | 6               | 6                     | 18           | 16          |
| C40 <sup>2</sup>            | 1087+50 | 9               | 3                     | 18           | 16          |
| C41 <sup>4</sup>            | 1089+25 | 6               | 6                     | 22           | 17          |
| C42 <sup>4</sup>            | 1089+25 | 9               | 3                     | 22           | 17          |
| C43 <sup>4</sup>            | 1094+75 | 6               | 6                     | 22           | 18          |
| C44 <sup>4</sup>            | 1094+75 | 9               | 3                     | 22           | 18          |
| C45 <sup>3</sup>            | 1096+50 | 4.5             | 7.5                   | 21           | 19          |
| C46 <sup>3</sup>            | 1096+50 | 6               | 6                     | 21           | 19          |
| C47 <sup>3</sup>            | 1096+50 | 7.5             | 4.5                   | 21           | 19          |
| C48 <sup>3</sup>            | 1096+50 | 9               | 3                     | 21           | 19          |
| C49 <sup>3</sup>            | 1102+50 | 6               | 6                     | 21           | 20          |
| C50 <sup>3</sup>            | 1102+50 | 9               | 3                     | 21           | 20          |
| C51 <sup>3</sup>            | 1108+00 | 6               | 6                     | 20           | 21          |
| C52 <sup>3</sup>            | 1108+00 | 9               | 3                     | 20           | 21          |
| C53 <sup>3</sup>            | 1114+00 | 6               | 6                     | 20           | 22          |
| C54 <sup>3</sup>            | 1114+00 | 9               | 3                     | 20           | 22          |
| C55 <sup>1</sup>            | 1117+00 | 4.5             | 7.5                   | 13           | 23          |
| C56 <sup>1</sup>            | 1117+00 | 6               | 6                     | 13           | 23          |
| C57 <sup>1</sup>            | 1117+00 | 7.5             | 4.5                   | 13           | 23          |
| C58 <sup>1</sup>            | 1117+00 | 9               | 3                     | 13           | 23          |
| C59 <sup>1</sup>            | 1123+00 | 6               | 6                     | 13           | 24          |
| C60 <sup>1</sup>            | 1123+00 | 9               | 3                     | 13           | 24          |
| C61 <sup>1</sup>            | 1125+00 | 4.5             | 7.4                   | 26           | 25          |
| C62 <sup>1</sup>            | 1125+00 | 6               | 6                     | 26           | 25          |
| C63 <sup>1</sup>            | 1125+00 | 7.5             | 4.5                   | 26           | 25          |
| C64 <sup>1</sup>            | 1125+00 | 9               | 3                     | 26           | 25          |
| C65 <sup>1</sup>            | 1131+00 | 6               | 6                     | 26           | 26          |
| C66 <sup>1</sup>            | 1131+00 | 9               | 3                     | 26           | 26          |

1 - Cores of Surface only

2 - Cores of Surface and BTB

3 - Cores of Surface and PBTB

4 - Cores of Surface with BTB and PBTB

Table 18. Asphalt Concrete and bound base core locations, SPS-1 Arizona (Contd.).

| Sample Location Designation | Station | Offset, feet    |                       | Test Section | Sample Area |
|-----------------------------|---------|-----------------|-----------------------|--------------|-------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |             |
| C67 <sup>1</sup>            | 1134+00 | 4.5             | 7.5                   | 25           | 27          |
| C68 <sup>1</sup>            | 1134+00 | 6               | 6                     | 25           | 27          |
| C69 <sup>1</sup>            | 1134+00 | 7.5             | 4.5                   | 25           | 27          |
| C70 <sup>1</sup>            | 1134+00 | 9               | 3                     | 25           | 27          |
| C71 <sup>1</sup>            | 1140+00 | 6               | 6                     | 25           | 28          |
| C72 <sup>1</sup>            | 1140+00 | 9               | 3                     | 25           | 28          |
| C99 <sup>1</sup>            | 1162+35 | 4.5             | 7.5                   | 28           | 31          |
| C100 <sup>1</sup>           | 1162+35 | 6               | 6                     | 28           | 31          |
| C101 <sup>1</sup>           | 1162+35 | 7.5             | 4.5                   | 28           | 31          |
| C102 <sup>1</sup>           | 1162+35 | 9               | 3                     | 28           | 31          |
| C103 <sup>1</sup>           | 1168+25 | 6               | 6                     | 28           | 32          |
| C104 <sup>1</sup>           | 1168+25 | 9               | 3                     | 28           | 32          |

1 - Cores of Surface only

2 - Cores of Surface and BTB

3 - Cores of Surface and PBTB

4 - Cores of Surface with BTB and PBTB

Table 19. Locations for in-place density measurements on compacted Asphalt Concrete.

| Sample Location Designation | Station | Offset, feet    |                       | Test Section |
|-----------------------------|---------|-----------------|-----------------------|--------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |
| T111                        | 1010+55 | 6               | 6                     | 15           |
| T112                        | 1012+00 | 6               | 6                     | 15           |
| T113                        | 1013+50 | 6               | 6                     | 15           |
| T114                        | 1015+00 | 6               | 6                     | 15           |
| T115                        | 1016+45 | 6               | 6                     | 15           |
| T116                        | 1018+55 | 6               | 6                     | 17           |
| T117                        | 1020+00 | 6               | 6                     | 17           |
| T118                        | 1021+50 | 6               | 6                     | 17           |
| T119                        | 1023+00 | 6               | 6                     | 17           |
| T120                        | 1024+45 | 6               | 6                     | 17           |
| T121                        | 1028+05 | 6               | 6                     | 24           |
| T122                        | 1029+50 | 6               | 6                     | 24           |
| T123                        | 1031+00 | 6               | 6                     | 24           |
| T124                        | 1032+50 | 6               | 6                     | 24           |
| T125                        | 1033+95 | 6               | 6                     | 24           |
| T126                        | 1039+05 | 6               | 6                     | 23           |
| T127                        | 1040+50 | 6               | 6                     | 23           |
| T128                        | 1042+00 | 6               | 6                     | 23           |
| T129                        | 1043+50 | 6               | 6                     | 23           |
| T130                        | 1044+95 | 6               | 6                     | 23           |
| T131                        | 1052+55 | 6               | 6                     | 19           |
| T132                        | 1054+00 | 6               | 6                     | 19           |
| T133                        | 1055+50 | 6               | 6                     | 19           |
| T134                        | 1057+00 | 6               | 6                     | 19           |
| T135                        | 1058+45 | 6               | 6                     | 19           |
| T136                        | 1064+55 | 6               | 6                     | 14           |
| T137                        | 1066+00 | 6               | 6                     | 14           |
| T138                        | 1067+50 | 6               | 6                     | 14           |
| T139                        | 1069+00 | 6               | 6                     | 14           |
| T140                        | 1070+45 | 6               | 6                     | 14           |
| T141                        | 1073+05 | 6               | 6                     | 16           |
| T142                        | 1074+50 | 6               | 6                     | 16           |
| T143                        | 1076+00 | 6               | 6                     | 16           |
| T144                        | 1077+50 | 6               | 6                     | 16           |
| T145                        | 1078+95 | 6               | 6                     | 16           |
| T146                        | 1081+55 | 6               | 6                     | 18           |
| T147                        | 1083+00 | 6               | 6                     | 18           |
| T148                        | 1084+50 | 6               | 6                     | 18           |
| T149                        | 1086+00 | 6               | 6                     | 18           |
| T150                        | 1087+45 | 6               | 6                     | 18           |

Table 19. Locations for in-place density measurements on compacted Asphalt Concrete (Contd.).

| Sample Location Designation | Station | Offset, feet    |                       | Test Section |
|-----------------------------|---------|-----------------|-----------------------|--------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |
| T151                        | 1089+30 | 6               | 6                     | 22           |
| T152                        | 1090+50 | 6               | 6                     | 22           |
| T153                        | 1092+00 | 6               | 6                     | 22           |
| T154                        | 1093+50 | 6               | 6                     | 22           |
| T155                        | 1094+70 | 6               | 6                     | 22           |
| T156                        | 1096+55 | 6               | 6                     | 21           |
| T157                        | 1098+00 | 6               | 6                     | 21           |
| T158                        | 1099+50 | 6               | 6                     | 21           |
| T159                        | 1101+00 | 6               | 6                     | 21           |
| T160                        | 1102+45 | 6               | 6                     | 21           |
| T161                        | 1108+05 | 6               | 6                     | 20           |
| T162                        | 1109+50 | 6               | 6                     | 20           |
| T163                        | 1111+00 | 6               | 6                     | 20           |
| T164                        | 1112+50 | 6               | 6                     | 20           |
| T165                        | 1113+95 | 6               | 6                     | 20           |
| T166                        | 1117+05 | 6               | 6                     | 13           |
| T167                        | 1118+50 | 6               | 6                     | 13           |
| T168                        | 1120+00 | 6               | 6                     | 13           |
| T169                        | 1121+50 | 6               | 6                     | 13           |
| T170                        | 1122+95 | 6               | 6                     | 13           |
| T171                        | 1125+05 | 6               | 6                     | 26           |
| T172                        | 1126+50 | 6               | 6                     | 26           |
| T173                        | 1128+00 | 6               | 6                     | 26           |
| T174                        | 1129+50 | 6               | 6                     | 26           |
| T175                        | 1130+95 | 6               | 6                     | 26           |
| T176                        | 1134+05 | 6               | 6                     | 25           |
| T177                        | 1135+50 | 6               | 6                     | 25           |
| T178                        | 1137+00 | 6               | 6                     | 25           |
| T179                        | 1138+50 | 6               | 6                     | 25           |
| T180                        | 1139+95 | 6               | 6                     | 25           |
| T181                        | 1162+40 | 6               | 6                     | 28           |
| T182                        | 1163+75 | 6               | 6                     | 28           |
| T183                        | 1165+25 | 6               | 6                     | 28           |
| T184                        | 1166+75 | 6               | 6                     | 28           |
| T185                        | 1168+20 | 6               | 6                     | 28           |

Table 20. Locations for cores of the Asphalt Concrete surface material for the SHRP Materials Reference Library, SPS-1 Arizona.

| Sample Location Designation | Station   | Offset, feet    |                       | Test Section | Sample Area |
|-----------------------------|-----------|-----------------|-----------------------|--------------|-------------|
|                             |           | Center Line, Rt | Outside Lane Edge, Lt |              |             |
| CS1                         | 1025+00   | 3               | 9                     | 17           | 4           |
| CS2                         | 1025+01.5 | 2               | 10                    | 17           | 4           |
| CS3                         | 1025+01.5 | 4               | 8                     | 17           | 4           |
| CS4                         | 1025+03   | 3               | 9                     | 17           | 4           |
| CS5                         | 1025+04.5 | 2               | 10                    | 17           | 4           |
| CS6                         | 1025+04.5 | 4               | 8                     | 17           | 4           |
| CS7                         | 1025+06   | 3               | 9                     | 17           | 4           |
| CS8                         | 1025+07.5 | 2               | 10                    | 17           | 4           |
| CS9                         | 1025+07.5 | 4               | 8                     | 17           | 4           |
| CS10                        | 1025+09   | 3               | 9                     | 17           | 4           |
| CS11                        | 1025+10.5 | 2               | 10                    | 17           | 4           |
| CS12                        | 1025+10.5 | 4               | 8                     | 17           | 4           |
| CS13                        | 1025+00   | 6               | 6                     | 17           | 4           |
| CS14                        | 1025+01.5 | 5               | 7                     | 17           | 4           |
| CS15                        | 1025+01.5 | 7               | 5                     | 17           | 4           |
| CS16                        | 1025+03   | 6               | 6                     | 17           | 4           |
| CS17                        | 1025+04.5 | 5               | 7                     | 17           | 4           |
| CS18                        | 1025+04.5 | 7               | 5                     | 17           | 4           |
| CS19                        | 1025+06   | 6               | 6                     | 17           | 4           |
| CS20                        | 1025+07.5 | 5               | 7                     | 17           | 4           |
| CS21                        | 1025+07.5 | 7               | 5                     | 17           | 4           |
| CS22                        | 1025+09   | 6               | 6                     | 17           | 4           |
| CS23                        | 1025+10.5 | 5               | 7                     | 17           | 4           |
| CS24                        | 1025+10.5 | 7               | 5                     | 17           | 4           |

Table 21. Field and laboratory test plan for as-delivered Roller Compacted Concrete materials, SPS-1 Arizona.

| Test Name   | SHRP Test Designation | SHRP Protocol | No. of Tests | Material Source / Test Location |
|---|-----------------------|---------------|--------------|---------------------------------|
| Roller Compacted Concrete - As Delivered (Note 1) |                       |               |              |                                 |
| Compressive Strength                              | PC01                  | P61           |              |                                 |
| 14 Day  |                       |               | 3            | FC1, FC2, FC3                   |
| 28 Day  |                       |               | 3            |                                 |
| 1 Year  |                       |               | 3            |                                 |
| Splitting Tensile Strength                        | PC02                  | P62           |              |                                 |
| 14 Day  |                       |               | 3            | FC1, FC2, FC3                   |
| 28 Day  |                       |               | 3            |                                 |
| 1 Year  |                       |               | 3            |                                 |
| Flexural Strength                                 | PC09                  | P69           |              |                                 |
| 14 Day  |                       |               | 3            | FC1, FC2, FC3                   |
| 28 Day  |                       |               | 3            |                                 |
| 1 Year  |                       |               | 3            |                                 |
| Air Content                                       | ASTM C231             | LTPP Method   | 3            | FC1-FC3                         |
| Slump   | ASTM C143             | LTPP Method   | 3            | FC1 - FC3                       |
| Temperature                                       | ASTM C1064            | LTPP Method   | 3            | FC1 - FC3                       |

Note:

1. A total of 6 cylinder specimens and 3 beam specimens are molded from each RCC bulk sample.

Table 22. Bulk samples and molded specimens from **Roller Compacted Concrete** mix, SPS-1 Arizona.

| Sample Number | Test Age After Placement | Specimen Number                  |                                  |                                  | Test Section |
|---------------|--------------------------|----------------------------------|----------------------------------|----------------------------------|--------------|
|               |                          | 6"x12" Cylinder Compression Test | 6"x12" Cylinder Indirect Tensile | 6"x6"x20" Beam Flexural Strength |              |
| FC1           | 14 days                  | GX1                              | GX4                              | FX1                              | 27           |
|               | 28 days                  | GY2                              | GY5                              | FY2                              |              |
|               | 1 year                   | GZ3                              | GZ6                              | FZ3                              |              |
| FC2           | 14 days                  | GX7                              | GX10                             | FX4                              | 27           |
|               | 28 days                  | GY8                              | GY11                             | FY5                              |              |
|               | 1 year                   | GZ9                              | GZ12                             | FZ6                              |              |
| FC3           | 14 days                  | GX13                             | GX16                             | FX7                              | 27           |
|               | 28 days                  | GY14                             | GY17                             | FY8                              |              |
|               | 1 year                   | GZ15                             | GZ18                             | FZ9                              |              |

Table 23. Field and laboratory test plan for as-placed Roller Compacted Concrete materials, SPS-1 Arizona.

| Test Name                             | SHRP Test Designation | SHRP Protocol | Number of Tests | Material Source / Test Location |
|---------------------------------------|-----------------------|---------------|-----------------|---------------------------------|
| Roller Compacted Concrete - As Placed |                       |               |                 |                                 |
| Compressive Strength                  | PC01                  | P61           |                 |                                 |
| 14 Day                                |                       |               | 3               | C76, C81, C90                   |
| 28 Day                                |                       |               | 3               | C75, C82, C91                   |
| 1 Year                                |                       |               | 3               | C73, C84, C93                   |
| Splitting Tensile Strength            | PC02                  | P62           |                 |                                 |
| 14 Day                                |                       |               | 3               | C80, C85, C98                   |
| 28 Day                                |                       |               | 3               | C79, C86, C95                   |
| 1 Year                                |                       |               | 3               | C77, C88, C96                   |
| PCC Unit Weight                       | PC05                  | P65           | 9               | All Compressive strength cores  |
| Static Modulus of Elasticity          | PC04                  | P64           |                 |                                 |
| 28 Day                                |                       |               | 3               | C78, C83, C92                   |
| 1 Year                                |                       |               | 3               | C74, C87, C97                   |
| Air Content @ 28 Days                 | PC08                  | P68           | 1               | C89                             |
| PCC Thermal Coef.                     |                       | Ship to FHWA  | 1               | C94                             |

Table 24. Roller Compacted Concrete core locations, SPS-1 Arizona.

| Sample Location Designation | Station | Offset, Feet    |                       | Test Section | Sample Area | Coring, Days After Placement |
|-----------------------------|---------|-----------------|-----------------------|--------------|-------------|------------------------------|
|                             |         | Center Line, Rt | Outside Lane Edge, Lt |              |             |                              |
| C73                         | 1142+50 | 4.5             | 7.5                   | 27           | 29          | 350-360                      |
| C74                         | 1142+50 | 6               | 6                     | 27           | 29          | 350-360                      |
| C75                         | 1142+50 | 7.5             | 4.5                   | 27           | 29          | 21-24                        |
| C76                         | 1142+50 | 9               | 3                     | 27           | 29          | 10-13                        |
| C77                         | 1142+53 | 4.5             | 7.5                   | 27           | 29          | 350-360                      |
| C78                         | 1142+53 | 6               | 6                     | 27           | 29          | 21-24                        |
| C79                         | 1142+53 | 7.5             | 4.5                   | 27           | 29          | 21-24                        |
| C80                         | 1142+53 | 9               | 3                     | 27           | 29          | 10-13                        |
| C81                         | 1142+56 | 4.5             | 7.5                   | 27           | 29          | 10-13                        |
| C82                         | 1142+56 | 6               | 6                     | 27           | 29          | 21-24                        |
| C83                         | 1142+56 | 7.5             | 4.5                   | 27           | 29          | 21-24                        |
| C84                         | 1142+56 | 9               | 3                     | 27           | 29          | 350-360                      |
| C85                         | 1148+44 | 3               | 9                     | 27           | 30          | 10-13                        |
| C86                         | 1148+44 | 4.5             | 7.5                   | 27           | 30          | 21-24                        |
| C87                         | 1148+44 | 6               | 6                     | 27           | 30          | 350-360                      |
| C88                         | 1148+44 | 7.5             | 4.5                   | 27           | 30          | 350-360                      |
| C89                         | 1148+44 | 9               | 3                     | 27           | 30          | 21-24                        |
| C90                         | 1148+47 | 3               | 9                     | 27           | 30          | 10-13                        |
| C91                         | 1148+47 | 4.5             | 7.5                   | 27           | 30          | 21-24                        |
| C92                         | 1148+47 | 6               | 6                     | 27           | 30          | 21-24                        |
| C93                         | 1148+47 | 7.5             | 4.5                   | 27           | 30          | 350-360                      |
| C94                         | 1148+47 | 9               | 3                     | 27           | 30          | 21-24                        |
| C95                         | 1148+50 | 4.5             | 7.5                   | 27           | 30          | 21-24                        |
| C96                         | 1148+50 | 6               | 6                     | 27           | 30          | 350-360                      |
| C97                         | 1148+50 | 7.5             | 4.5                   | 27           | 30          | 350-360                      |
| C98                         | 1148+50 | 9               | 3                     | 27           | 30          | 10-13                        |

Notes

Cores to be taken 10 - 13 days after placement of the RCC material, designated in the shaded rows above, may be taken directly from the RCC surface if the ACFC has not been placed by this date. Otherwise, cores of the RCC should be taken through the ACFC layer.

Table 25. Elevation survey locations, SPS-1 Arizona.

| Sample Location Designation | Station | Rt Offset, Center Line, feet |   |   |   |   | Lt Offset, Lane Edge, Feet |   |   |   |    | Test Section |
|-----------------------------|---------|------------------------------|---|---|---|---|----------------------------|---|---|---|----|--------------|
|                             |         | 1                            | 2 | 3 | 4 | 5 | 1                          | 2 | 3 | 4 | 5  |              |
| E1                          | 1011+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E2                          | 1011+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E3                          | 1012+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E4                          | 1012+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E5                          | 1013+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E6                          | 1013+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E7                          | 1014+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E8                          | 1014+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E9                          | 1015+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E10                         | 1015+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E11                         | 1016+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 15           |
| E12                         | 1019+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E13                         | 1019+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E14                         | 1020+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E15                         | 1020+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E16                         | 1021+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E17                         | 1021+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E18                         | 1022+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E19                         | 1022+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E20                         | 1023+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E21                         | 1023+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E22                         | 1024+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 17           |
| E23                         | 1028+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E24                         | 1029+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E25                         | 1029+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E26                         | 1030+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E27                         | 1030+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E28                         | 1031+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E29                         | 1031+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E30                         | 1032+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E31                         | 1032+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E32                         | 1033+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |
| E33                         | 1033+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 24           |

Table 25. Elevation survey locations, SPS-1 Arizona (Contd.).

| Sample Location Designation | Station | Rt Offset, Center Line, feet |   |   |   |   | Lt Offset, Lane Edge, Feet |   |   |   |    | Test Section |
|-----------------------------|---------|------------------------------|---|---|---|---|----------------------------|---|---|---|----|--------------|
|                             |         | 1                            | 2 | 3 | 4 | 5 | 1                          | 2 | 3 | 4 | 5  |              |
| E34                         | 1039+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E35                         | 1040+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E36                         | 1040+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E37                         | 1041+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E38                         | 1041+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E39                         | 1042+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E40                         | 1042+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E41                         | 1043+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E42                         | 1043+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E43                         | 1044+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E44                         | 1044+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 23           |
| E45                         | 1053+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E46                         | 1053+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E47                         | 1054+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E48                         | 1054+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E49                         | 1055+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E50                         | 1055+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E51                         | 1056+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E52                         | 1056+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E53                         | 1057+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E54                         | 1057+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E55                         | 1058+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 19           |
| E56                         | 1065+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E57                         | 1065+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E58                         | 1066+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E59                         | 1066+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E60                         | 1067+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E61                         | 1067+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E62                         | 1068+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E63                         | 1068+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E64                         | 1069+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E65                         | 1069+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |
| E66                         | 1070+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 14           |

Table 25. Elevation survey locations, SPS-1 Arizona (Contd.).

| Sample Location Designation | Station | Rt Offset, Center Line, feet |   |   |   |   | Lt Offset, Lane Edge, Feet |   |   |   |    | Test Section |
|-----------------------------|---------|------------------------------|---|---|---|---|----------------------------|---|---|---|----|--------------|
|                             |         | 1                            | 2 | 3 | 4 | 5 | 1                          | 2 | 3 | 4 | 5  |              |
| E67                         | 1073+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E68                         | 1074+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E69                         | 1074+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E70                         | 1075+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E71                         | 1075+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E72                         | 1076+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E73                         | 1076+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E74                         | 1077+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E75                         | 1077+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E76                         | 1078+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E77                         | 1078+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 16           |
| E78                         | 1082+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E79                         | 1082+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E80                         | 1083+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E81                         | 1083+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E82                         | 1084+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E83                         | 1084+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E84                         | 1085+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E85                         | 1085+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E86                         | 1086+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E87                         | 1086+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E88                         | 1087+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 18           |
| E89                         | 1089+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E90                         | 1090+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E91                         | 1090+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E92                         | 1091+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E93                         | 1091+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E94                         | 1092+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E95                         | 1092+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E96                         | 1093+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E97                         | 1093+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E98                         | 1094+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |
| E99                         | 1094+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 22           |

Table 25. Elevation survey locations, SPS-1 Arizona (Contd.).

| Sample Location Designation | Station | Rt Offset, Center Line, feet |   |   |   |   | Lt Offset, Lane Edge, Feet |   |   |   |    | Test Section |
|-----------------------------|---------|------------------------------|---|---|---|---|----------------------------|---|---|---|----|--------------|
|                             |         | 1                            | 2 | 3 | 4 | 5 | 1                          | 2 | 3 | 4 | 5  |              |
| E100                        | 1097+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E101                        | 1097+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E102                        | 1098+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E103                        | 1098+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E104                        | 1099+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E105                        | 1099+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E106                        | 1100+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E107                        | 1100+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E108                        | 1101+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E109                        | 1101+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E110                        | 1102+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 21           |
| E111                        | 1108+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E112                        | 1109+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E113                        | 1109+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E114                        | 1110+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E115                        | 1110+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E116                        | 1111+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E117                        | 1111+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E118                        | 1112+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E119                        | 1112+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E120                        | 1113+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E121                        | 1113+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 20           |
| E122                        | 1117+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E123                        | 1118+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E124                        | 1118+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E125                        | 1119+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E126                        | 1119+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E127                        | 1120+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E128                        | 1120+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E129                        | 1121+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E130                        | 1121+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E131                        | 1122+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |
| E132                        | 1122+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 13           |

Table 25. Elevation survey locations, SPS-1 Arizona (Contd.).

| Sample Location Designation | Station | Rt Offset, Center Line, feet |   |   |   |   | Lt Offset, Lane Edge, Feet |   |   |   |    | Test Section |
|-----------------------------|---------|------------------------------|---|---|---|---|----------------------------|---|---|---|----|--------------|
|                             |         | 1                            | 2 | 3 | 4 | 5 | 1                          | 2 | 3 | 4 | 5  |              |
| E133                        | 1125+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E134                        | 1126+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E135                        | 1126+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E136                        | 1127+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E137                        | 1127+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E138                        | 1128+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E139                        | 1128+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E140                        | 1129+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E141                        | 1129+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E142                        | 1130+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E143                        | 1130+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 26           |
| E144                        | 1134+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E145                        | 1135+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E146                        | 1135+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E147                        | 1136+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E148                        | 1136+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E149                        | 1137+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E150                        | 1137+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E151                        | 1138+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E152                        | 1138+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E153                        | 1139+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E154                        | 1139+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 25           |
| E155                        | 1143+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E156                        | 1143+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E157                        | 1144+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E158                        | 1144+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E159                        | 1145+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E160                        | 1145+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E161                        | 1146+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E162                        | 1146+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E163                        | 1147+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E164                        | 1147+50 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |
| E165                        | 1148+00 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 27           |

Table 25. Elevation survey locations, SPS-1 Arizona (Contd.).

| Sample Location Designation | Station | Rt Offset, Center Line, feet |   |   |   |   | Lt Offset, Lane Edge, Feet |   |   |   |    | Test Section |
|-----------------------------|---------|------------------------------|---|---|---|---|----------------------------|---|---|---|----|--------------|
|                             |         | 1                            | 2 | 3 | 4 | 5 | 1                          | 2 | 3 | 4 | 5  |              |
| E166                        | 1162+75 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E167                        | 1163+25 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E168                        | 1163+75 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E169                        | 1164+25 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E170                        | 1164+75 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E171                        | 1165+25 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E172                        | 1165+75 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E173                        | 1166+25 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E174                        | 1166+75 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E175                        | 1167+25 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |
| E176                        | 1167+75 | 12                           | 9 | 6 | 3 | 0 | 0                          | 3 | 6 | 9 | 12 | 28           |